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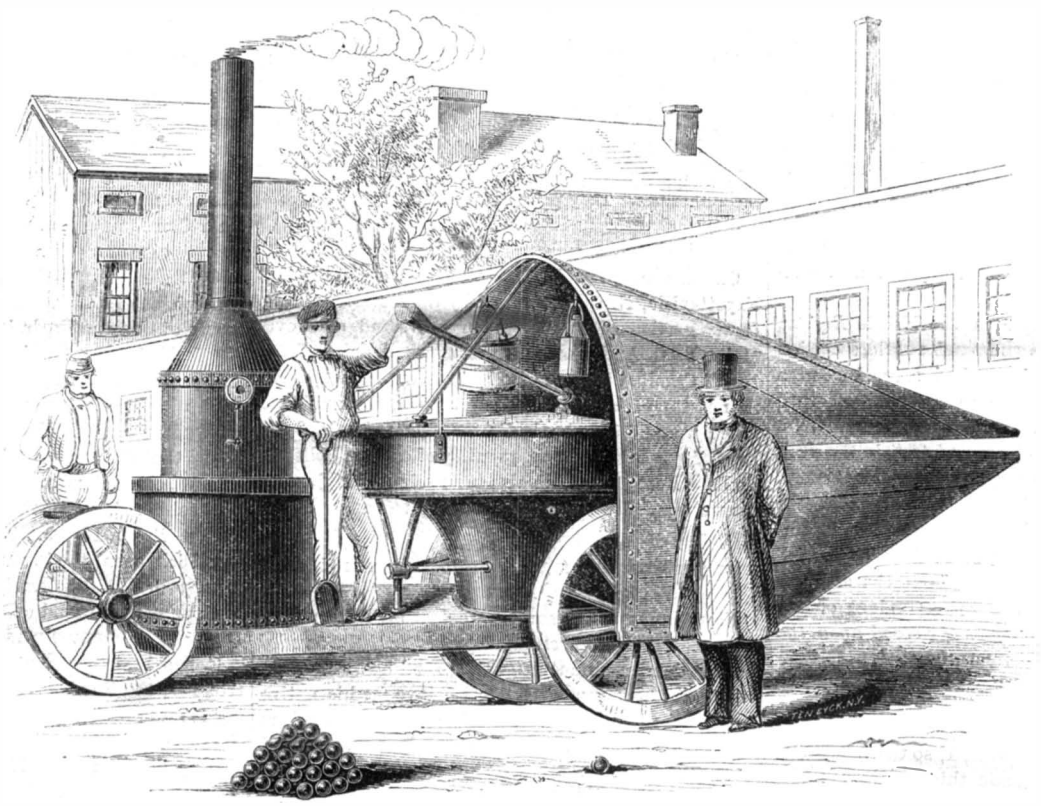
The Baltimore Steam Battery.

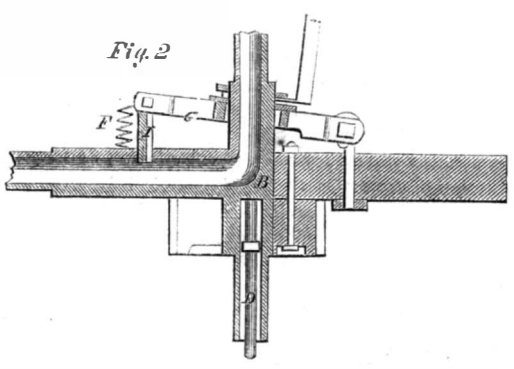
The annexed engraving represents a perspective view, taken from a photograph, of the famous steam battery, about which so much has been said within a few weeks, as being in process of construction by the Messrs. Winans of Baltimore. From a letter by Mr. Thos. Winans, published in the Baltimore papers, it appears that the machine belongs to the city of Baltimore, and that the only ground for connecting the name of the Winanses with it is the fact that it was sent to their shop for repair. It was invented by Charles S. Dickinson, of Cleveland, Ohio, and patented August 9, 1859. Its capabilities and advantages are set forth in the following terms by the inventor :—

"As a triumph of inventive genius, in the application and practical demonstration of centrifugal force (that power which governs and controls the universe, and regulates and impels the motion of planetary bodies around the sun), this most efficient engine stands without a parallel, commanding wonder and admiration at the simplicity of its construction and the destructiveness of its effects, and is eventually destined to inaugurate a new era in the science of war. Rendered ball proof, and protected by an iron cone, and mounted on a four-wheeled carriage, it can be readily moved from place to place, or kept on march with an army. It can be constructed to discharge missiles of any capacity from an ounce ball to a 25-pound shot, with a force and range equal to the most approved gunpowder projectiles, and can discharge from one hundred to five hundred balls per minute. For city or harbor defense it would prove more efficient than the largest battery; for use on the battle field, the musket caliber engine would mow down opposing troops as the scythe mows standing grain; and in sea fights, mounted on low-decked steamers, it would be capable of sinking any ordinary vessels. In addition to the advantages of power, continuous action and velocity of discharge, may be added economy in cost of construction, in space, in labor and transportation; all of which would be small in comparison to the cost and working of batteries of cannon, and the equipment and management of a proportionate force of infantry. The possessi n of this engine—ball proof and cased in iron—will give the powers using it such decided advantages as will strike terror to the hearts of opposing forces, and render its possessors impregnable to armies provided with ordinary offensive weapons. Its efficiency will soon be practically demonstrated, and the day is not far distant when, through its instrumentality, the new era in the science of war being inaugurated, it will be generally adopted by the Powers of the Old and New Worlds, and, from its very destructiveness, will prove the means and medium of peace."

The construction of the gun is represented in Fig. 2. A steel gun barrel, bent at an elbow as shown, is caused to revolve by steam power with great velocity; when the balls, being fed into the perpendicular portion, which is at the center of revolution, are thrown out of the horizontal arm by centrifugal force. A gate, J, keeps the balls from flying out until the barrel is in the desired position, when this gate is opened by the action of the lever, C, and the balls permitted to escape. To make sure against accident from the chance issuing of balls when the barrel is not in the proper position, a strong wrought iron casing surrounds the gun, with a slit in one side through which the balls may pass, as shown in Fig. 1. Our cut represents the balls as being fed in singly by hand, but in action it is proposed to feed them in with a shovel. Mr. Winans says that the shot from this gun will cut off a nine inch scantling at the distance of half a mile.



THE BALTIMORE STEAM GUN.



The battery is represented in our engraving as standing in front of Messrs. Winans' extensive works in Baltimore, a part of the buildings being represented.

In 1837, Benjamin Reynolds, of Kinderhook, N. Y., constructed a centrifugal war engine for discharging bullets in a stream from a tube. It was operated by two men, one standing at each side working a crank, and turning it in the same manner as two men operate a windlass. The bullets, we understand, were taken from a hopper at the center of a revolving drum and thrown out at the circumference, the action being similar to that of a rotary pump. A small war engine of Mr. Reynolds' was tried at West Point, in 1837, before General Worth and several other officers of the United States Army, and it is stated that, at 110 yards distance from the target, it sent 1,000 2-ounce balls in a minute, through 3¾ inches of hard pine plank. After this it was taken to Washington, and experiments made with it before a committee of Congress and several military officers, with results similar to those obtained at West Point. At this trial the committee exercised great perseverance; first, in regard to its power and range, and, second, in regard to the number of shots projected in a given time. On this occasion the power applied was as before, one man at each of the two cranks. The target, three thicknesses of one inch pine planks, at the distance of 150 yards. Each ball was projected through the target, falling from three to four hundred yards beyond it into the Potomac river. They were not so successful, however, in determining the number of shots thrown in a given time. In this test sixty balls of 2 oz. were placed in a tin tube of sufficient size and length to contain them. One end of the tube was then placed at the admitting orifice of the battery, into which they were carried by the action of gravity and the exhausting disposition of the machine. The space of time taken for the projection of sixty shots was so small a portion of a second that the committee could not report any specific space of time at all. A more full description of this war engine will be found on page 147, Vol. XII. (old series), of the SCIENTIFIC AMERICAN.

EXTENSIVE DAMAGE BY A FRESHET.—The recent southern rains, acting on the masses of snow in the northern portions of the country, have produced extensive freshets. On the 8th of May, the Presumpscott river, which empties into the harbor of Portland, Maine, rose to a great hight, carrying away mills, bridges, &c. Pope's mills were destroyed, and every bridge between Sebago Pond and Sacarrappa was swept away.

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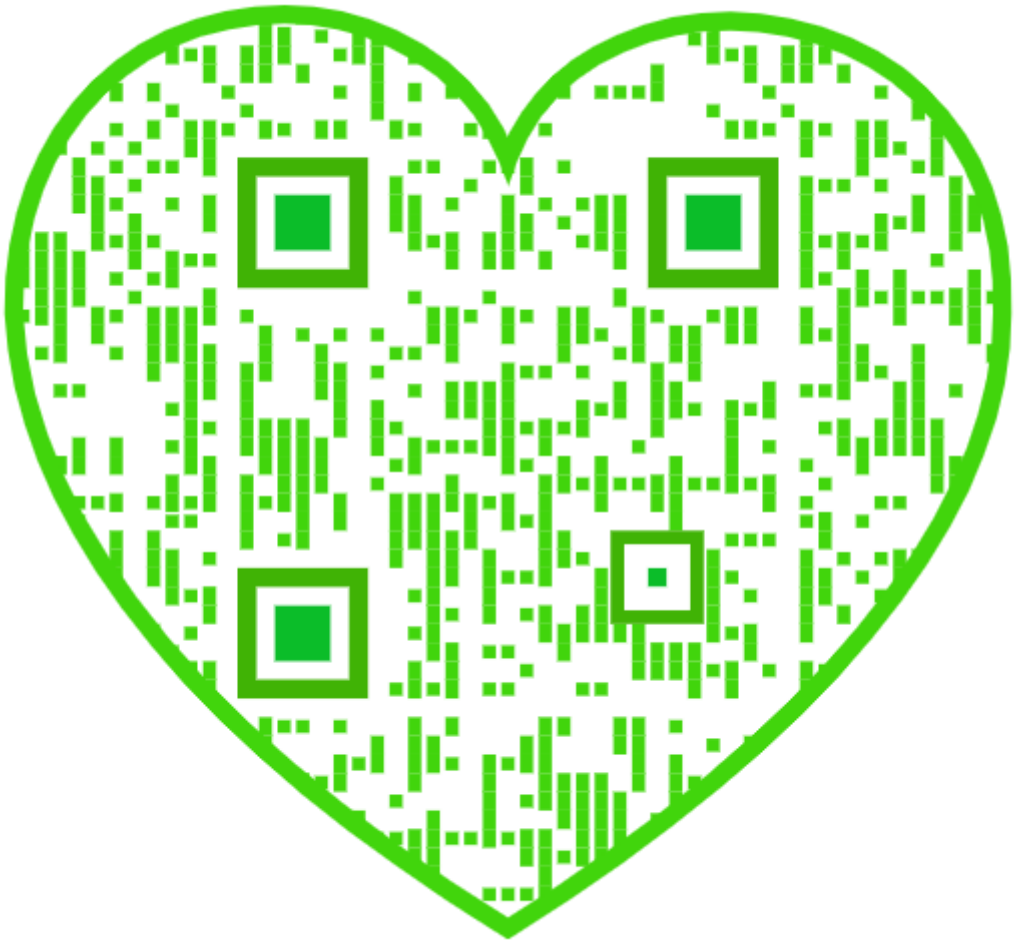

THE WAR.

OPERATIONS OF THE SECESSIONISTS.

While advices of the movements of troops of the Northern States are flashed to this city instantly by telegraph, so that we are informed of them as they occur, the possession of the mails and wires in the seceded States by the secession officers makes the news from that region very slow in reaching us, and it is only long after events occur that we are able to obtain reliable intelligence concerning them. In grouping together and arranging the great mass of telegrams and reports which have filled the papers for the last month, we find standing out prominently two great movements of the secessionists—one on the 12th of April, which included the assault on Fort Sumter and an attempt on Fort Pickens, and the other of the 17th of April, in connection with the secession of Virginia.

THE NARROW ESCAPE OF FORT PICKENS.

We have already alluded to this wonderful deliverance, but not with the particularity which its great interest and importance demand. By explicit instructions from Mr. Walker, the Secession Secretary of War, General Beauregard commenced his bombardment of Fort Sumter on the morning of April 12th. It now seems clear that the plan also embraced the design of capturing Fort Pickens by surprise. A fleet under Commodore Adams was lying off the harbor of Pensacola, in the neighborhood of Fort Pickens, with a company of United States artillery on board of one of the vessels—the sloop of war *Brooklyn*—and the captain of this company had received orders from General Scott to take his men into Fort Pickens. But under the peaceful policy of the government, orders had been previously sent to Commodore Adams, by the Secretary of the Navy, not to land any reinforcements at Fort Pickens; and he accordingly refused to send the artillery ashore. A messenger was, however, on his way from Washington with orders to Com. Adams from the Secretary of the Navy to land the reinforcements.

A letter some time since in the Mobile *Register*, stated that Gen. Bragg, the commander of the secession forces besieging Fort Pickens, had formed a plan for taking the fort by surprise on the evening of April 12th. He had selected 500 men, and armed them with unloaded muskets, as he meant to "do the work with cold steel." On this very day however, the 12th of April, the messenger from the Secretary of the Navy arrived with his orders to Commodore Adams to land the reinforcements, and the *Brooklyn* accordingly moved up to the wharf and put the artillery company into the fort. The correspondent of the *Register* said that General Bragg's spy stood upon the wharf and counted the soldiers as they went in, and, on making his report, the plan for the surprise was abandoned. It was stated that the attack was to be made at midnight; the reinforcements reached the fort between 11 and 12 o'clock of the same night! As part of the plot, one of the sergeants in the garrison—a man by the name of Brody—had been bribed to open the gates; but he was detected, and now lies in irons between the decks of the *Brooklyn*, looking forward to the fellon's death which his treachery deserves.

This is the account of the narrow escape of Fort Pickens, as nearly correct as we can make it from the data at present at hand.

THE GREAT PLOT OF THE 17TH OF APRIL.

After the capture of Fort Sumter and the failure to surprise Fort Pickens, a very extensive plan of operations was arranged for the 17th, in combination with the secession of Virginia. This embraced the capture of Harper's Ferry and the Norfolk Navy Yard, as preliminary to an attack upon Washington. We have already related the burning of both these places by the federal forces in charge of them. Information has since been coming in that the plot embraced the simultaneous seizure of property over a large portion of the Southern States, including steamboats plying upon Southern waters, either employed by the Federal government or belonging to citizens of the Northern States. The most valuable steamer seized was the *Star of the West*, which had been chartered by the government and sent to Texas to bring away a body of United States soldiers. The *Star of the West* is a noble great steamship, formerly running between New York and San Juan, on the Nicaragua route to California. The writer of this has made a voyage in her, and knows her to be one of the best seaboats afloat. The following particulars of her seizure are furnished by Mr. D. W. Topham, the first officer:—

SEIZURE OF THE "STAR OF THE WEST."

The steamer was lying at anchor at Indianola, expecting to receive troops on board. On the 17th of April, the pilot came on board and told Captain Howe that 700 *Federal* troops were coming on the *Fashion* and another steamer, and requested that he would be ready to receive them at any hour, day or night, that they might arrive alongside. Shortly after midnight on the 19th, the steamer *Rusk* came out, and was hailed by Captain Howe. The captain of the *Rusk*, in answer, said that he had 320 Federal troops which he wished to put on board. All hands were accordingly called out, and every assistance offered to receive the troops. As soon as they were fairly on board, Captain Howe and his officers were surrounded, and informed that the steamer was seized by the authorities of Texas, and that they were prisoners. Caught in this trap, resistance was useless, and Captain Howe reluctantly gave up his ship. The Texans were armed with Minié rifles and swords. Captain Smith, of the *Rusk*, was installed as commander of the *Star of the West*, Captain Howe and his officers being put below under a guard. Smith pretended that he was acting under orders from the owners of the *Rusk*, and of the other steamers of the lines between New Orleans and Texan ports. All these vessels, however, have been seized by the Governor of Louisiana. The steamer was taken to Galveston, where Captain Smith resigned the command to Captain Farwell, of the steamer *Mexico*, and the *Star of the West* was started for New Orleans. The old officers of the vessel were sent below and confined to their rooms the night before she reached the mouth of the Mississippi, and they were kept there under guard. After their arrival at New Orleans, on the 21st, an officer boarded the steamer, and gave notice that all hands must decide in twenty minutes whether they would join the Southern army or get ready to go home. No one enlisted. The second officer, second and third assistant engineers, quartermaster's crew and firemen, 30 in all, left the vessel under guard as prisoners of war, expecting to be sent home at the expense of the C. S. A. Captain Howe, the first and third officers, the chief engineer and the first assistant engineer, decided to stay by the ship, but they were taken ashore and detained until the 25th. On the 26th, they were sent to Mobile with an escort, but instead of going to Montgomery, as they were desired to do, they took the route *via* Cincinnati, taking a free pass from the authorities. They paid their own passages from Cincinnati to New York.

SEIZURE OF THE FAYETTEVILLE ARSENAL.

On the same eventful 17th of April, the arsenal at Fayetteville, N. C., was seized by the secession forces. It was garrisoned by 50 men, in command of Brevet Major S. S. Anderson. It was surrendered to 2,200 North Carolina troops, who had assembled to take it, if necessary, by force. The arms and munitions taken were 37,000 stand of arms, 6,000 pistols, 3,000 kegs of powder, and any quantity of cannon balls and shells. Fort Macon has also been seized. Major Anderson was left at the arsenal, being too unwell to be removed.

MOVEMENTS OF THE SECESSIONISTS SINCE THE 17TH OF APRIL.

From innumerable sources we learn that a perfect reign of terror has been established in all the seceded States. A man cannot utter the proud boast of being an American citizen, or express a love for his native country in any way, without being seized by members of the inquisition which has been improvised, and forced to serve in the secession ranks. Hundreds of warm patriots are fleeing from this odious tyranny and coming to the North, many of them to aid in establishing the power of our excellent government again throughout all the land. Simultaneously with this expulsion on suppression of the Union men, there is a very extensive volunteering of soldiers for the secession army, not only throughout the seceded States, but also in Tennessee, and to some extent even in Kentuck and Maryland. The universal determination has undoubtedly been to attack Washington, and either hold or destroy it. Washington has always occupied a far more prominent position in the minds of the Southern people than it has in those of the North, and the secessionists appeal to a very powerful sentiment when they call for volunteers to take possession of the capital. Washington is believed to be safe, but it seems probable that at least one great battle must be fought somewhere in the vicinity on this issue, probably on Virginia soil. Travelers, arriving from the Southern States, report finding the cars everywhere filled with troops, all moving toward Washington.

MOVEMENTS AT THE NORTH.

The administration had determined to have no more militia of the first levy for three months forwarded to Washington, and a regiment from Ulster county, in this State, which had arrived in this city, had been ordered to return home. But reports of the gathering of secessionist forces to take the capital, induced the Union Defence Committee of this city to apply to Governor Morgan to send the Ulster regiment on, and they accordingly left on the morning of May 7th, and other regiments are to follow.

THE PENNSYLVANIA TROOPS THROUGH BALTIMORE.

At the same time, a large movement of Pennsylvania troops to Washington, through Maryland, was in progress.

On Thursday, the 9th of May, a body of Pennsylvania of troops were sent by steamer from Perryville to Baltimore, where they took the cars for Washington, passing through some four miles of the outskirts of Baltimore.

They consisted of five companies of the Third Infantry, regulars, Major Shepherd, 420 men; one company of Sherman's Battery of Light Infantry, with six pieces of cannon and seventy horses, under Major Sherman; and the First Regiment, ten companies, of Pennsylania Artillery, Colonel Patterson, armed with muskets, and numbering 800 men. They were landed at Locust Point, one of the termini of the Baltimore and Ohio Railroad, within half a mile of Fort McHenry, and there transferred on board of two trains of cars, which departed immediately for Washington. The troops were viewed with satisfaction by the residents in the vicinity, and no unpleasant indications were manifested. Two hundred men were left to take charge of the horses, provisions and baggage, and these were to be forwarded at a later hour. The Mayor and Police Commissioners, with two hundred police, crossed in a ferry boat to Locust Point, and were present at the debarkation. The *Harriet Lane* stood off the point with her ports open. The transfer to the cars was accomplished without much difficulty, and there was no excitement other than that which proceeded from the curiosity of the people to witness the proceedings. The track from Locust Point skirts the lower part of the city, and joins the main stem near Camden station.

CAPTURE OF THE BALTIMORE STEAM GUN.

On the morning of May 10th, a wagon, containing a suspicious looking box and three men, was observed going out on the Frederick road from Baltimore, and the fact being communicated to General Butler, at the Relay House, he despatched a scouting party in pursuit, who overtook the wagon six miles beyond the Relay House, at Illchester. On examination it was found that the box contained Dickenson's steam gun. It was being taken to Harper's Ferry when captured. The soldiers brought the gun and the three men back to the Relay House. The prisoners—one of whom was Dickenson, the inventor of the gun—were sent to Annapolis. A full description and illustration of this weapon will be found on another page.

MOVEMENTS AT THE WEST.

It has been apparent, from the beginning of the troubles, that in the great States of the West the feeling is more universal and earnest in the determination to support the government and preserve the integrity of the nation, if possible, than it is even in the Eastern and Middle States. It seems as if the whole male population—and a portion of the female—are ready to pour down and demolish the conspirators who are endeavoring to destroy the country.

CAIRO.

At the extreme southern point of the State of Illinois, where the Ohio river empties into the Mississippi, is the little town of Cairo. The importance of this site attracted the attention of capitalists many years ago, and, notwithstanding the fact that the point of land between the two rivers is a vast, low swamp, they determined to lay out a great city here, and they gave it the name of Cairo, in the hope that it would rival its ancient Egyptian namesake in extent and power. Malaria, musquitos, and the difficulty of access to the country in the rear, proved more than a match for the advantages of the position, and the place languished until it was made the terminus of the Illinois Central Railroad. This great concern erected machine shops, &c., and the large freighting business of the road gave the place a start. As the town was subject to frequent overflows from freshets in the Mississippi, it was determined to build a levee around it 80 feet wide and 10 feet high, and the work was commenced in 1857, but the water rose above this in 1858, and nearly destroyed the town.

The great strategetic importance of Cairo, com-

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manding as it does the Ohio and Mississippi rivers, and forming the terminus of the longest railroad in the country, pointed it out at the beginning of the war as a place to be promptly occupied. It was accordingly taken possession of by a body of Illinois volunteers, under the command of Colonel Prentiss, and they have been busy strengthening its defenses. The levee forms an excellent breastwork, and as the Kentucky shore on the opposite side of the Ohio is a swamp, the place can be assailed only from one of the rivers, or by bombardment from Missouri, on the opposite side of the Mississippi river. The Missouri river enters the Mississippi 150 miles above the mouth of the Ohio, and, consequently, Cairo commands the communication of all the upper valley of the Mississippi with the South. Cairo is the most southerly point in the free States, and is nearly two degrees farther south than Washington. On the 2d of May it was stated that the forces under Colonel Prentiss amounted to 5,200 men, with 30 pieces of cannon, and additional troops have been arriving since. There was a good deal of talk among the secessionists down the river of moving up in steamboats and attacking Cairo, but there is no apprehension of any danger of the success of such an attack.

MISSOURI.

Great interest continues to be centered on the State of Missouri, the most northerly of the slave States, and the largest of them in area, with the exception of Texas. There is a powerful Union sentiment in the State, especially in the commercial city of St. Louis, which has a population of 160,000. But the Governor of the State sympathizes strongly with the secessionists, and seems disposed to have Missouri cast in her lot with them.

CAPTURE OF A LARGE SECESSION FORCE.

Several thousand men in St. Louis have enlisted as United States volunteers, and been organized under command of Capt. Lyon. A brigade was raised on the side of the secessionists, and encamped on the western outskirts of the city, under the command of General Frost. On the afternoon of May 10th, Captain Lyon surrounded General Frost's brigade, and took them all prisoners. About 800 men were there in camp, a large number being in the city on leave. They laid down their arms and were escorted to the city as prisoners of war. A release on parole has been tendered to the officers and troops, providing they would take an oath not to take up arms again against the government of the United States, which they declined, on the ground that it implied they had already taken up arms against the government, which they disclaimed.

Just before the troops left for the city, and while the State forces were drawn up between the two lines of volunteers, several rocks were thrown at the volunteers, and a few pistol shots fired by excited parties in the surrounding crowd, which was composed of a large number of citizens, including many women and children. One shot took effect in the leg of Captain Blautowski, and as he fell he gave word to fire, which was obeyed by some two or three companies, resulting in the death of upwards of twenty persons, including two women and several children, and badly wounding several others.

The captured troops were subsequently released, the officers on their parole of honor, and the men taking an oath not to serve against the United States during the present war.

BLOCKADE OF THE MISSISSIPPI AND OHIO.

The Secretary of the Treasury has instructed the Collectors at Louisville and St. Louis to examine the manifests and cargoes of all steamboats bound to any part of the seceded States, and to allow none to depart with arms, munitions or provisions.

THE SEIZURE OF FORT SMITH.

On the 24th of April, Fort Smith, Arkansas, was seized by a body of secessionists under Colonel Solon Borland. The value of property at the place belonging to the United States government is estimated at $300,000.

THE SECESSION OF TENNESSEE.

The Legislature of Tennessee has passed an act of secession, to be submitted to a vote of the people on the 8th of June next.

THE SECESSION OF ARKANSAS.

On Monday, May 6th, the Legislature of Arkansas passed an act of secession by a vote of 69 to 1.

LETTERS OF MARQUE AND HEAD MONEY.

On Monday, May 6th, the Congress of the Confederate States passed an act recognizing war with the United States, and authorizing their President to use all the land and naval forces of the secessionists to carry on their warfare against the government of their country. The act also authorizes the President to issue "letters of marque and general reprisal against the vessels, goods and effects of the government of the United States, and the citizens or inhabitants of the States and Territories thereof, except" the slave States and the Territories of Arizona, New Mexico, and the Indian Territory south of Kansas. Section 10th of the act provides :—

That a bounty shall be paid by the Confederate States of $20 for each person on board any armed ship or vessel, belonging to the United States, at the commencement of an engagement, which shall be burnt, sunk or destroyed by any vessel commissioned as aforesaid, which shall be of equal or inferior force, the same to be divided as in other cases of prize money—and a bounty of $25 shall be paid by the owners, officers and crews of the private armed vessels, commissioned as aforesaid, for each and every prisoner by them captured and brought into port, and delivered to an agent authorized to receive them, in any port of the Confederate States; and the Secretary of the Treasury is hereby authorized to pay or cause to be paid to the owners, officers and crews of such private armed vessels, commissioned as aforesaid, or their agent, the bounties herein provided.

This section exhibits more forcibly than anything else that has yet occurred the extreme ferocity with which the secessionists mean to urge their war.

WESTERN VIRGINIA REFUSING TO SECEDE.

On Monday, May 13th, a convention of delegates from some thirty of the western counties of Virginia met at Wheeling for the purpose of arranging some plan to resist the secession movement in the eastern part of the State, and for preserving their connection with the Union. Their action was not known at the time of our going to press.

Lieutenant M. F. Maury Run Away.

We regret to learn that Lieutenant Maury, so long connected with the Observatory at Washington, and who has distinguished himself in the scientific world, has abandoned his post, and it is presumed, gone over to aid and comfort the secessionists. We have never considered many of Lieutenant Maury's experiments and publications of any practical use, although his reports on winds and currents annually produced were very elaborate, and have given him a national fame.

We knew Mr. Maury personally, and when we first heard of his deserting his post were reluctant to believe the report; but from what we since learn, there is no doubt of the fact. The United States government has always been liberal to this man, and placed its vast resources at his disposal for scientific purposes, thus contributing largely to his fame; but he could not rise superior to the secession influences around him. His last day in Washington was spent in the transaction of customary business with the heads of the departments, from whom he parted with apparent friendliness; he went home, packed up his goods, and departed under the shades of night, absenting himself from duty without leave.

Another Steam Gun.

A Milwaukie paper gives a description of a steam gun which it claims as the invention of Dr. Draper Stone, of that city. It says:—"This implement or engine of death consists of a boiler and engine, with a revolving cylinder or barrel, whose length is to vary according to the size of the ball which it is desired to shoot. This cylinder has half-a-dozen bores, the same as a revolver, from each of which balls are continually forced out as fast as the cylinder can be made to revolve. The cylinder is fed with balls from a hopper, and the balls can be fired, if the cylinder can be made to revolve fast enough, several hundred a minute—two or three hundred a minute without any difficulty. This cylinder is connected with a crank by means of which it can be pointed in any direction, the same as the hose of a fire engine. It is proposed to make the boiler so that the steam will be at a pressure of 1,000 lbs. to the inch. For throwing a musket ball the cylinder should be about ten feet in length, but the machine can be made to throw a cannon ball of five pounds weight a distance of five miles. It would throw a musket ball two miles, and kill a man."

McCarty's New and Powerful Cannon---480 Balls Fired in One Minute without Powder---Gunpowder Superseded by Centrifugal Force.

The rage among inventors at the present time seems to be for centrifugal guns. A very powerful one was exhibited in this city on the 9th inst.; and as we were not able to be present, we copy the following description from the New York *Herald* :—

An exhibition of a new and unique cannon took place yesterday afternoon at the foot of Thirty-third street, North river. It is one of the most singular implements of war that has ever been exhibited to the American people, and places Winans' gun entirely in the shade, sending balls at the rate of 480 per minute without any powder or an apparent effort. The gun used yesterday in the experiment had only an inch bore, and was about three feet long. This modest looking gun is attached to a wheel about four feet in diameter, and not over four inches thick, looking like a flange, or, as some would call it, a balance wheel. On one side of this wheel or flange is a tube which connects the wheel with a hopper, in which are poured the balls in a promiscuous manner, as apples are thrown into the hopper of a cider mill, the machinery inside of the wheel receiving the balls, carrying them around to the gun barrel, and throwing them through the bore of the gun at the rate mentioned above, simply by the centrifugal force, and at a velocity almost incredible.

The motion of this wheel is kept up by means of cranks attached to cogwheels, about five feet in the rear of the large wheel or feeder to the gun barrel, a band passing from these wheels to a pulley on the side of the large wheel. The gun that we saw in operation, using one-inch balls, was worked by six men at the cranks as motive power, one as feeder, pouring the balls into the hopper, and the inventor of the gun in the rear of all, taking aim and shifting the gun at will from one direction to another. With the power got up in this way, balls poured out of the gun in a perfect stream, and it appeared as though one continuous shower was being hurled against the target, stationed about 50 yards distant, most of them going through three thicknesses of boards. The gun was afterward raised at an angle of 30°, and its capacity as to distance tested. The river at the foot of Thirty-third street is about one and three-fourth miles wide. The gun was stationed some distance back from the shore, and the balls were seen to drop into the water among the shad poles toward the west side of the Hudson, at the lowest estimate one mile from the starting point, and all this by centrifugal force or the arrangement of the machinery to use this throwing off power.

When the machinery is put in motion it sounds like a threshing machine, and has a like hum about it. The only report about its firing is the clank of the balls passing into the large wheel. They pass off without the least noise, no one knowing their departure until they strike the target at a distance. The experiment yesterday was a complete success, and its operation justifies the assertion that, for the purpose of putting down a street mob, no implement has been invented its equal. No band of desperadoes could stand many minutes before an incessant fire of almost 500 balls per minute. The same inventor has a 32-pounder on the principle of the gun completed. The machinery works by means of steam, and will throw fully as many balls as the small gun.

The inventor of this wonderful implement of war is Mr. McCarty. He has spent some ten years upon the project, and has finally obtained a gun that bids fair to do all that his wildest dreams pictured to him. They are manufactured by J. Colwell, No. 310 West Twenty-fourth street, who can make several per week. A person connected with the establishment intends to visit Washington the first of next week, and urge the War Department to try one of them.

Several of the officers of the regiments forming in the city witnessed the operation of the gun yesterday, and we understand that McLeod Murphy intends to take one for his regiment. It is really one of the wonders of the day, and if, on future trials, it sustains its yesterday's effort, it cannot fail to become a powerful and useful weapon of warfare.

THE MOVEMENTS OF TOWNS.—All over the Northern States, the various municipal bodies are making liberal appropriations to sustain the national government in this time of trial. We give in another column a list of the larger contributions of this character, but the aggregate appropriated by the thousands of the small towns, probably exceeds that of the large cities and States. There could be no more striking proof of the readiness of the people to make whatever sacrifices may be necessary to save the country. As a specimen of this action of the smaller places, a correspondent says that the little town of Monson, in Massachusetts, with a population of only about 3,000 inhabitants, recently called a town meeting and appropriated $5,000 towards fitting out a company and sustaining the families of the volunteers while on duty.

CAPTURE OF UNITED STATES TROOPS IN TEXAS.—Col. Van Dorn, with 800 Texans, has captured 450 Federal troops under Major T. Sibley, who were at Indianola and attempted to escape in two sailing vessels. Van Dorn pursued them in three steamers armed with artillery.

NEW YORK CITY TROOPS.—The forces which have already left New York and Brooklyn, or are ready to march immediately, amount to 31,040 men.

ON the 10th of May there were lying in the port of New York 36 steamships, 104 ships, 108 barks, 119 brigs, 199 schooners.

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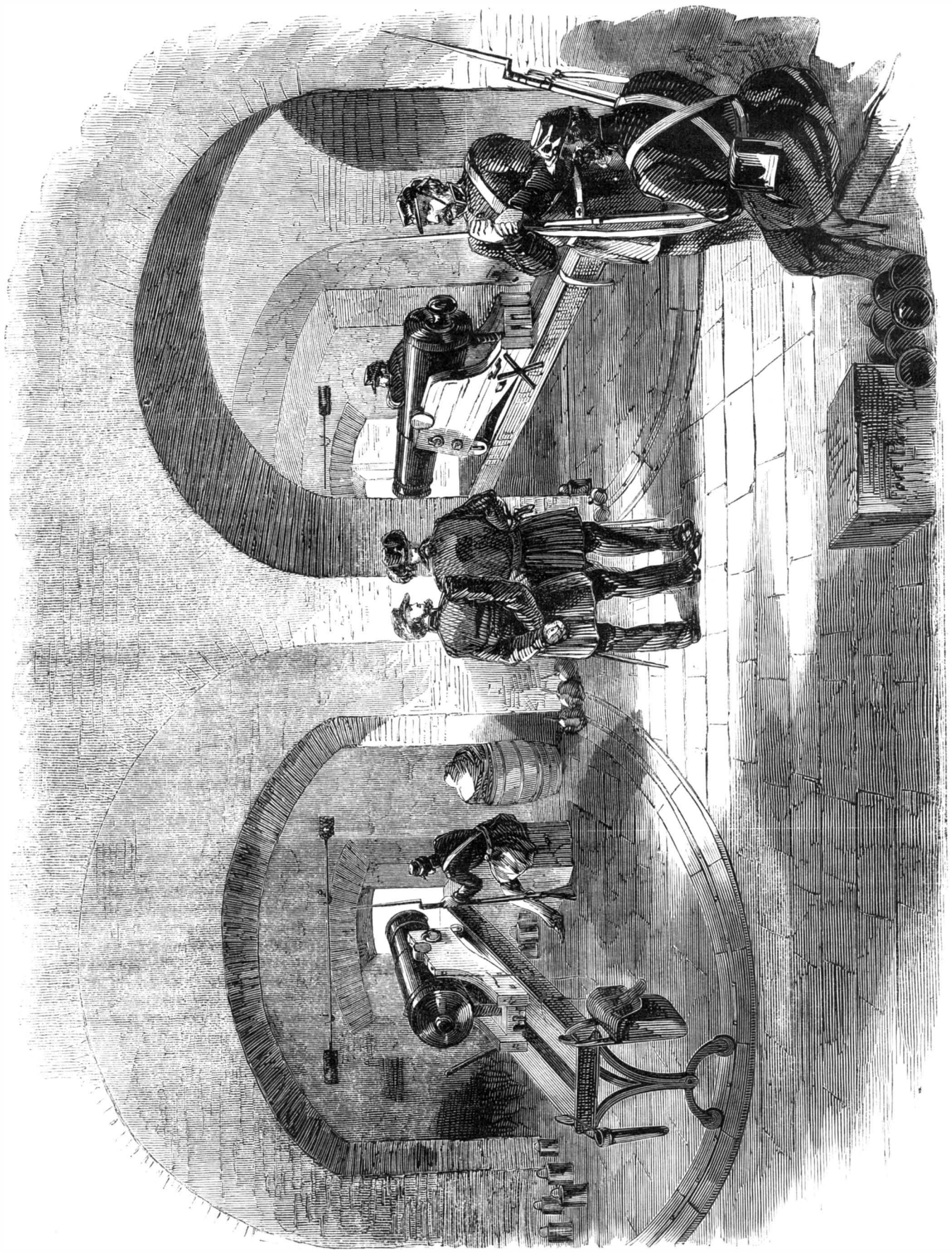
Fort Pickens—Embrasures and Casemates.

On page 202 of our present volume, we published a brief abstract of Major Barnard's comparison between the embrasures formed by American engineers and those generally found in European fortifications. As the walls of forts are made very thick, it would be impossible to point the guns in any direction except in one directly perpendicular to the face of the fort, unless the embrasures or openings through which the cannon are fired are made flaring. It has been the practice among European military engineers to flare the embrasure outward, but as shot will glance from the flaring sides, embrasures thus constructed operate like large tunnels to gather the enemy's balls and guide them in among the garrison, producing generally great destruction. Colonel Totten, therefore, in 1815, determined to construct the embrasures in our forts flaring inward, thus reducing very materially the external opening. But, as making the narrowest portion of the embrasure at the external face of the wall, would give an acute angle to the masonry easily broken off by the impact of cannon balls, the throat was carried inward two-fifths of the thickness of the wall from the external face, and from this point the embrasure flares both ways. By this arrangement, an obtuse angle was obtained at the throat, but little liable to be broken by the enemy's shot. This is the style of embrasure in all of our fortifications which were built previous to 1855, when the introduction of iron facings permitted a further improvement, as was explained on page 202.

We here present a perspective view of two of the embrasures in Fort Pickens, drawn by an officer in Lieutenant Slemmer's command. The view also shows two of the cannon mounted for service, with some of the officers and soldiers of the garrison. The guns are mounted each on two carriages, the upper of which runs back with the recoil of the piece on being fired, while the lower one traverses on a circular railway to vary the direction of the gun. The stone roofs over the cannon are called casemates. They are designed to be of sufficient thickness to resist the force of any shot or shells that may be thrown upon them.

Fort Pickens commands the harbor of Pensacola, Fla., and is now besieged by several thousand secessionists, though it is thought, since its recent reinforcement, to be able to withstand any attack that may be made upon it.



TWO EMBRASURES IN THE FLANK BATTERY OF FORT PICKENS.

New Iron Bridges.

The Philadelphia *Ledger* states that the Pennsylvania Railroad bridge to cross the Schuylkill, near the United States Arsenal, is to be of iron, three spans, each 192 feet. The top chord of the bridge will be

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of cast iron, and the lower chord of wrought iron eye bars. The verticals and main diagonals will also be of wrought iron, and the counter diagonals will be adjusted by screws. A bridge on the Murphy-Whipple plan, for the Harrisburg and Lancaster Railroad Company, recently leased by the Pennsylvania Railroad, will cross the stream at Middletown. It is 118 feet span, having three trusses proportioned to carry 6,000 pounds per lineal foot, at a maximum load. This bridge is to supply the place of a wooden one put up in 1855.

Virginia and Kentucky.

These two States are now centers of great importance. The former has cast her lot with the Confederate States, while the latter is endeavoring to preserve an armed neutrality. It yet remains to be seen how far this peculiar status can be preserved by the State, while so many of her hardy sons are struggling to draw her into the fortune of secession and civil war. It is the general desire of the Confederate States politicians to transfer the devastating effects of war to Virginia and Kentucky. The former State has, to all appearances, accepted this honor; the latter seems now inclined to forego it, if possible.

Howell Cobb spoke at Atlanta, Ga., recently, and, after dilating on the strength of the South, announced that the people of the Gulf States were bound in honor to come up manfully to the fight, as all apprehensions of danger to themselves were past, and that the fields of conflict will be in the States of Virginia, Maryland, and Kentucky.

General Pillow, of Tennessee, in a recent appeal to the people of that State, to rally to arms in defense of the Southern Confederacy, assures them that "Memphis is safe," and that the fight will be on the soil of Kentucky. The people of the old Commonwealth wherein rest the bones of Henry Clay do not seem to relish this programme. If Memphis is safe, then why should not Louisville be safe also? Why should not the hitherto loyal State of Kentucky be preserved from the tread of a Southern army, bringing along with it ruin and desolation? This matter has become to Kentuckians too serious to joke about, and hence we see such of her citizens as John J. Crittenden, James Guthrie, Nat. Wolfe, Archibald Dixon, Judge Nichols, Judge Bullock, J. Young Brown, Leslie Coombs, and others, coming forward to resist the infatuation of the secession mania.

Our Soldiers Must be Taught to Take Care of Themselves.

1. The soldier should be self-reliant, able to cook, wash, mend and provide for himself.

2. He should be taught to endure thirst, or rather not to be thirsty in the middle of the day on the march. The way to do this, is not to drink any fluids, whether in camp or on duty, from one meal to another, and do his main drinking at the close of the day. It is astonishing how quickly this abstinence from drink in mid-day can be learned by any one who will persevere.

3. Every man should be provided with a Mackinaw blanket, and a piece of india-rubber cloth of the same size. This india-rubber cloth should be provided with button holes on one side, and buttons upon the other, at every 12 inches distant. The object of these are to button them together, when two soldiers are out scouting. The buttoning of these together will make a good and sufficient tent for them, in case of rain or heavy dews.

4. In malarious districts, where fever, ague and dysentery abound, the soldier should protect himself at nightfall from the radiation of heat from the earth. Keep out of the dews, and build camp fires after any rain, for thorough drying of his clothing, arms and camp.

5. In the bivouack, he should select, if possible, a shelter on the lee side of a hill, hammock, log of wood, fence, tree, and, if nothing better offers, he should be taught to throw up a miniature rampart of sods, to protect him from the winds.

6. The soldier should be instructed in the art of cooking—even the poorest rations can be made palatable by ingenious cooking. His flour should be made into bread, not cakes from the griddle, short cake, or anything of the kind, but well baked bread. His meat, usually salt, should be well soaked in fresh water before boiling or roasting, his coffee not made strong; but his tea, after a march or field duty, should be sufficiently strong to cheer and animate the drooping spirits.

7. Cleanliness of person, clothing, equipage and camp, are as indispensable as a bright musket and dry powder.

8. He should guard against sun stroke by putting into hat or cap his handkerchief, or, what is better, green leaves, or grass, even rags will do better than nothing.

9. Upon going into battle, he should put into his pocket all the spare handkerchiefs and rolls of lint he may have, to be prepared to stanch the flowing of blood promptly, and be taught the applying of ligatures between the wound and the heart, when arteries are wounded, and, between the wound and the extremities, when merely the veins are injured.

10. As much as possible he should lead a quiet, orderly life, avoiding dissipation, be cheerful and prompt in duty, and maintain good pluck to the end.

Protection to Troops from Sunstroke.

It is of the highest importance that our valiant troops should be thoroughly cared for. At first, owing to the sudden rush toward Washington, and the interruption of travel through Baltimore, much hardship was experienced by those who led the way to the capital; but now matters are going on much better, and every effort is being made by our people to relieve the troops as much as possible from needless hardship and exposure.

Experience has shown that troops serving in warm climates greatly need protection from sunstroke, often quite as dangerous and fatal as the fire of the enemy.

The judicious care and foresight of the British officers in the recent campaigns in India and in the Crimea, protected their soldiers from the danger by thick white linen cap covers, having a cape protecting the back of the neck, which reflected instead of absorbing the heat of the sun.

The regions in and about Washington, say from latitude 37° to 40°, at which point our troops are concentrating, have an average temperature quite as high as that of Sevastopol in latitude 45°.

An exact pattern of the cap-cover used in the Crimea was furnished by a British officer to an association of patriotic ladies in this city, who have already completed a large number, and thousands more are now being made by fair hands. The health and lives, the comfort and security of these noble volunteers, must not be risked beyond what is absolutely necessary.

Business at the Troy Arsenal.

All the facilities of the Troy Arsenal are called into requisition now, to manufacture munitions of war. In the laboratory, about fifty hands are manufacturing cartridges, some intended for Minié rifles, and others far the common kinds of gun. They are prepared with almost incredible rapidity, and are filled with powder in another part of the building. Bags for cannon balls—some intended to hold columbiads and others for ordinary six-pounders—are also being made from a peculiar species of cloth-like moreen. Harnesses, saddles, &c., are being manufactured in another place.

But the great curiosity of the arsenal is the bullet machine, from which those deadly pieces of lead, more perfect in shape than slow hand processes can render them, pour out, as from a hopper, at the rate of 60,000 per day. The operator has merely to change the dies, and turn out conical or round bullets at pleasure. The machine works with a smoothness, precision, and automatic power that is really wonderful. There are only two similar ones in existence—one owned by the State of New York, and one presented to the Japanese last summer. Several foundries at Troy are casting cannon ball and shells. Machine shops and brass foundries are making fuzes and other implements of warfare.

A Great Copper Mine.—The Cliff Copper Mine, on Eagle river, Lake Superior, has been very profitable, it is stated, to the owners, it having paid $1,326,000 since 1849. The products of the mine are discharged through a gallery at the base of a lofty rock. This gallery penetrates the rock several hundred feet, and branches into sections which are united into one adit, and serve as a drain outlet for the water as well as the copper ore.

Boxing Dangerous Machinery.

Messrs. Editors:—I was pleased to notice a communication in your columns a short time since, calling attention to the frequent accidents arising from uncovered machinery. These accidents will continue to occur until a law is not only passed, but enforced, compelling all proprietors of machinery to put proper guards around the dangerous parts; also, forbidding the employment about machinery of children too young to understand the danger.

A natural curiosity draws many people, especially children, and in some cases with a sort of fascination, to witness the operation and to put their hands upon the most dangerous moving mechanism, and the presence of such persons should be absolutely forbidden, unless accompanied by others more experienced.

Placards should be exhibited in all manufactories, warning visitors of the danger of handling moving machinery; and I hope, for the sake of humanity, you will keep the subject before the people until the necessary reform is made.

In consideration of the bodily injuries resulting to persons falling under the wheels of railway cars, I have thought some sort of a screen might be suspended along the side of the cars, sufficient to prevent any person from getting under the wheels, and without interfering with the progress of the vehicle. Here is an opening for inventors. The substitution of iron for wood in the construction of railway carriages is one good step, and should be encouraged. R.

May 11, 1851.

Experiment in Making Butter.—The *American Agriculturist* states that Mr. Zoller of St. Lawrence county, at the request of the Commissioners of the State Agricultural Society, as we learn by their report, made an experiment as to the too much discussed modes of making butter. He took 208 quarts of milk and strained into pans, set till the cream had thoroughly risen, and skimmed and churned cold, and obtained 17½ lbs. of butter, ready for packing. The next day he took the same quantity of milk, strained it into the churns, and let it stand till sour, but not loppered, then churned and treated in the same manner and obtained 19¼ lbs. of butter. Analysis alone can show whether the increased quantity of the second is caused by a larger per centage of casein, or by more perfectly extracting the butter. If the quality of the butter is equally good, Mr. Zoller's method is worthy of the attention of our dairy men.

Benzine for Plants.—The London *Gardners' Chronicle* gives the following advice respecting the destruction of insects on plants: "As our houses and gardens are always, more or less, infested with vermin, it is satisfactory to know that benzine, an article become sufficiently well known as a detergent, is no less efficacious as an agent in insecticide. One or two drops are sufficient to asphyxiate the most redoubtable insect pest, be it beetle, cockchafer, spider, slugd caterpillar, or other creeping things. Even rats and mice will speedily decamp from any place sprinkle, with a few drops of the potent benzine. A singular fact connected with this application of benzine is, that the bodies of insects killed by it become so rigid, that their wings, legs, &c., will break rather than bend, if touched. Next day, however, when the benzine has evaporated, suppleness is restored."

Salt for Cabbages.—Edward Carpenter, a correspondent of the Pennsylvania *Farmer and Gardener*, last year tested the value of salt on cabbages, and with satisfactory results. After planting out his cabbages, he watered them some two or three times a week with salt water, containing about 15 grains of salt to the pint. The cabbages grew beautifully, and headed up very finely; while those which had no salt water given them produced loose, open heads, which were unfit for any other purpose than boiling. Rain water was given at the same time, and in the same quantities, as the salt water. He does not know how strong a solution of salt the cabbages would bear without injury, but is fully satisfied that a solution no stronger than that he used is decidedly beneficial.

The pass of Mount Cenis tunnel in the Alps was twice within the last month totally intercepted by enormous avalanches for three days. One of the houses of refuge was injured, the doors and windows were broken, and the place filled with snow.

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Mining Schools of Germany—The Academy at Freiberg—Its History—Present Condition and Peculiar Advantages.

[Letter from Germany to the Scientific American.]

The "Bergakademie" of Freiberg is the largest of the mining schools in Germany. There are several others where the theory and practice of mining are taught, but there is none which has for so long a time sustained so high a reputation. At Clausthal, in the Harz, there is a school for the education of the officers of the Hanoverian mines at Schemnitz, in Hungary; and at Przibram, in Bohemia, are others to supply the mines of those countries. At Leoben, in Styria, there is another mining school for the education of iron miners and metallurgists. Until within the last year, Prussia has had no mining school of her own, and has sent annual deputations to be educated at Freiberg. Recently, however, a mining department has been added to the University of Berlin.

The school at Freiberg is not only the largest but the oldest in Germany. About the commencement of the last century, just when the advantages of scientific knowledge in the working of mines were beginning to make themselves known, many of the proprietors of the different mines in the neighborhood of Freiberg sent their sons or assistants to a certain wise surveyor in the city, who gave them instruction as to the best manner of seeking and working veins. From this modest beginning rose the Freiberg Academy, which was finally founded by a royal order in 1765. For the first ten or twenty years it was nothing more than a provincial school; but it soon rose to take a much higher rank, through the exertions of Werner, who left the academy as a pupil in 1769 and returned to it as a teacher in 1775. The fame of his lectures soon attracted pupils from all parts of the world. Russians, Swedes, Englishmen, Frenchmen, Spaniards, Italians and Poles, all flocked to hear him and his novel theories upon the new sciences of mineralogy and geology, which were discussed by such men as Von Buch, Brandenburg, Humboldt, Hawkins, and others, who were to devote their lives to the study of the subjects he treated. His manner of teaching, too, was new. He delighted in taking his scholars upon geological walks, and illustrating his theories concerning the formation and character of strata by the very rocks whose existence he sought to explain. Sir Charles Lyell says of him: "The charm of his manners and his eloquence kindled enthusiasm in the minds of his pupils, and many who had intended at first only to acquire a slight knowledge of mineralogy, when they had once heard him, devoted themselves to it as the business of their lives. In a few years, a small school of mines, before unheard of in Europe, was raised to the rank of a great university, and men, already distinguished in science, studied the German language and came from the most distant countries to hear the great oracle of geology."

His splendid collection of precious stones, with his mineralogical and geological cabinets, even at that time valued at 56,000 thalers, were purchased by the academy, and the greater part of the sum he received for it he gave back to the institution in his will.

Since the time of Werner, the prosperity of the academy has been uninterrupted. Frequent and important additions have been made to her various collections—able and distinguished men have filled the chairs of her professors, and some of the most famous scientific scholars of the day have studied in her halls. Besides those already mentioned, the names of Moles, Naumann, Breithaupt, Weisbach, Von Cotta, Lampadius, Pluttner, Jameson and others—geologists, mineralogists, mechanics and chemists—stand upon the list of her professors and students.

At the present time the school is directly dependent upon the government, and is called the "Royal Saxon Bergakademie." The professors are appointed and receive their salaries from the crown; the rules and regulations are dictated by the Minister of Finance, and the general supervision is given to the Royal Board of Mines. The president of this board and the head of the academy is the "Oberberghauptmann," or "Chief Captain of Mines," who is, next to the king, the highest officer of the state in the Mining Department. The school is principally designed for the education of the officers and directors of the Saxon mines. Without studying here and passing an examination at the end of the course, no man can be appointed to any responsible position in the mines and furnaces of Saxony. Any native of the kingdom who can pass the light examination, and furnish the certificates of character required by the rules, can be admitted to the privileges of the academy; and upon the payment of 50 thalers per year, he can listen to as many lectures as he chooses. To those expecting to enter the Saxon service at the expiration of their course, special advantages are offered. Not only may the annual fee, in certain cases, be omitted, but the student may receive assistance from the government in the form of stipends, and a liberal sum may be granted to him to defray his traveling expenses when visiting the mines and furnaces of other places. The Saxon student has a practical course of six months in the mines to make before he is allowed to listen to the lectures. During this time he is expected to go down into the mines with the workmen at six o'clock in the morning and come back to daylight again at midday. He dons the miner's dress, and by actual experience, learns what it is to pick holes in rocks and separate ore from refuse. He acquires considerable knowledge of the appearance and parts of a mine—he gets some idea of the nature and habits of veins, and generally prepares himself to understand the lectures he is soon to hear. At first he is confined to one mine, and goes through all the preliminary work there; but afterward he is sent to such other shafts as will increase or diversify his knowledge. If he takes the regular course in the academy, he has four years of lectures and recitations upon lectures to go through with. At the end of this time he can pass his examination, and he has then a year of practical work in the mines or furnaces before he can be regularly admitted in the service of the government. Considering the wretchedly small salaries which the Saxon mining officers receive, it seems strange that so many should struggle to obtain them. Certain it is that there are generally two officers to one duty.

The privileges of the academy are open to any foreign student upon the presentation of the usual credentials and the payment of certain fees. These latter are, 1st, a fee of 6 thalers ($4.50) as entrance fee; 2d, an annual academical fee of 15 thalers; and 3d, the honorary fees for the lectures. The lectures vary in price from 10 to 30 per year. For the former of these sums, the student receives lectures for two hours in each week. For the latter he has four hours, with the privileges of working for himself in the chemical or metallurgical laboratory.

The student at Freiberg has the choice of three different courses of study. He may fit himself for a miner, a metallurgist or an engineer. For the miner, there are two courses of lectures on the "Art of Mining," from Professor Gatschmann; two courses on mechanics in general, and two more on the machines used in mines, from Professor Weisbach, together with various others on geology, formation of mines, mineralogy, chemistry, surveying (above and below ground), assaying, mining, law, drawing, &c., from the different professors connected with the academy. Besides the lectures, his privileges as an academist permit him to visit the mines whenever he wishes, and secure him the services of a guide without any cost to himself. What he sees on a large scale in the mines themselves, he can study in the form of models in the excellent collection belonging to the academy. He has access to a library, rich in works on subjects connected with his profession, of all dates and in several languages, and his lectures on geology and mineralogy are illustrated by collections which rank with the first in the world. For the metallurgist there are the chemical and metallurgical laboratories, the lectures on metallurgy in general from Professor Fritzsche, and those on the metallurgy of iron, from Professor Scheeren; the admirable instruction of Mr. Assessor Richter on assaying with the blowpipe, with the usual dry and wet assaying in practical exercises, the lectures on chemistry, mechanics, &c. To these are added the opportunities of taking a practical course in the furnaces near Freiberg, where all the ore from the mines in the district is melted up. For the engineer, finally, are the lectures of Professor Weisbach on mechanics; those of Professor Jungsen on surveying, with practical exercises above and below ground; and those on higher mathematics, descriptive geometry, art of building, drawing, &c., from the different professors of these branches.

As a place of study, Freiberg has several important advantages. The principal mining city of Saxony, it is situated in the center of the mineral region. Within a few hours' walk of its walls are no less than 130 different mines. Many of these date back for centuries, and present within themselves the whole history of the science of mining. The two great furnaces, where the different products of these mines are melted up, are both within two or three miles of the city. Besides the above-mentioned mines of silver, lead, copper, cobalt and nickel, we are but a short distance from the tin mines of Altenberg and Zuirwald in one direction, and those of Johann-Georgenstadt in another. About 20 miles northeast from Freiberg are the coal mines of Potschappel. In an opposite direction, we are not far removed from the coal mines and iron furnaces of Zwickan. With all these advantages for observing practice, Freiberg is excellently situated for studying theory. And then, too, it is exclusively a mining city. Everybody here earns his living from the mines or miners. Every man is either a miner or the brother of a miner. Every woman is either married to a miner or expects or would like to be. In the street the miner's dress is more common than any other, and even the little boys greet you with the miner's salutation, "Glück auf!"

In the year 1859–60, there were 143 students in the academy. Of these 56 were Saxons and 87 were foreigners. As would naturally be supposed, there was a great variety of nationalities among the latter. Fifteen came from countries where the English language is spoken; nine were from the United States. Of the rest there were Prussians, Austrians, Poles, Hungarians, Russians, Swedes, Norwegians, Englishmen, Frenchmen, Swiss, Italians, Spaniards, Chilians, Bolivians, &c. A few years ago, a young prince of Ashantee studied here. In so heterogeneous a company, a man with but one language at his command finds himself quite insulated. In a party of seven or eight who had assembled to bid good bye to a young American about to leave the academy, it was observed that five different languages were spoken.

One word, in conclusion, in relation to the cost of living here, for the benefit of those who may think of coming. Freiberg stands among the medium cities in that respect. The directors of the academy estimate it at 300 thalers yearly. That is probably much too low for a foreigner. Five hundred dollars, however, should be amply sufficient. J. H. B.

Photographic Inventions.

At a late meeting of the Photographic Society of Scotland, held in Edinburgh, a medal was presented to M. Claudet, a French artist, for improvements made in photography. The venerable and distinguished Sir David Brewster, in presenting him with his medal, brought under notice of the Society the numerous inventions and discoveries in that art, for which they were indebted to M. Claudet. Talent of research was seldom, he said, combined with mechanical skill in manipulation; but both these were possessed by M. Claudet, to whom had been awarded the Society's medal for the best portrait in the late Exhibition. He would briefly lay before them some of M. Claudet's inventions and discoveries. Among these were the increasing the sensitiveness of the original daguerreotype plate by the use of chloride of iodine, so that the time requisite for taking a portrait in the camera was reduced from ten minutes to a few seconds. This discovery he made in 1841. He had also perfected the image in the camera by his investigations in the achromatism of lenses. And in order to test the exact difference between the visual and chemical foci, he had invented the focimeter. He also had invented another instrument for measuring the intensity of object-glasses; and, in 1843, he had communicated to the Royal Society a valuable paper on the stereoscope. In 1857, he had communicated a paper on the phenomenon of relief in the image formed on the ground-glass of the camera, and founded on this an instrument which he called the stereomonoscope.

Remarkable Ancient Cannon.—The great gun illustrated in our last issue is generally supposed to be the largest in existence, but this is a mistake. At Ehrenbreitstein Castle, in Germany opposite Coblentz, on the Rhine, is a prodigious cannon, eighteen inches diameter of bore, three feet four inches diameter of breech. The charge of powder used in it has been 94 lbs. The inscription upon it shows it to have been made by one Simon in 1529. There is a still larger piece, of brass, made in the East Indies in 1685.

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Scientific Question---Iron and Steel.

M. Frémy, of the French Academy, has lately made a very important discovery in the course of a series of experiments conducted by him, for the purpose of ascertaining the composition of merchant iron and steel, which he communicated to the Academy at a meeting in Paris on the 11th of March. The discovery consists in the fact that, when iron is submitted first to a current of ammonia, and subsequently to a current of common coal gas, the surface is converted into steel, and that the longer the iron is submitted to the influence of nitrogen, the more complete is the subsequent conversion of the iron into steel. He concludes therefrom, and from other experiments, that without nitrogen steel cannot be produced; and that, properly speaking, steel is not a carburet, but a nitro-carburet of iron. MM. Boussingault, Dumas and Chevreuil complimented M. Frémy on his discovery.

It is well known that what is called "case hardening" consists in submitting iron to the influence of some compound containing nitrogen at a high heat; but it has hitherto been supposed that steel was really iron combined with a definite but a minute portion of carbon.

The common process of converting scrap iron into steel would lead us to conclude that nitrogen was not an element necessary to the manufacture of steel. Thus: if we take wrought iron in scraps, and mix it with a small quantity of charcoal dust and the oxyd of manganese, place them in a crucible and smelt them together, we obtain steel. No nitrogenous compound is employed in the mixture. We are well aware that nitrogen is employed in the manufacture of American Damascus steel, according to Neville's patented process; but none is employed in the common process which we have described.

We know that there has been a growing opinion among chemists respecting nitrogen forming a necessary element of steel, but we think this subject demands further investigation before M. Frémy's opinions are held to be final on the subject.

The Camel in Texas.

We take the following from Dr. Cloud's *Southern Rural Magazine*, published at Montgomery, Ala.:—

The power of endurance of the camels introduced into Texas was very severely tested during the past summer, by Captain Wm. H. Echels, of the Topographical Engineers, who started with them in the latter part of June to make a reconnoissance in Northwestern Texas. The country through which they had to travel was exceedingly rough, rocky and hilly, and destitute of water for long distances. The grass was all dried up, so that there was no forage for the animals. All the water for the party, both men and beasts, had to be carried on the backs of the camels and mules. Some of the hills traversed were so steep that the camels were obliged to resort to their feat of walking on their knees, to prevent their loads from falling.

No water was met with after leaving the river Pecos, a brackish stream, on the 29th of June, until the 4th of July, after a journey of 137 miles through the barren and difficult country above described. Owing to the supply of water falling short, the camels did not have a drop to taste in all this time—during six days; the mules were allowed none after the 1st of July; and the men composing the expedition were put on short allowance, and on the morning of the last day there were but two swallows of water for each man. All suffered terribly from thirst. The strength of both men and animals failed. Goods were abandoned because the animals could not carry them, and some of the mules broke down entirely and were left in the rear: while several of the men were sick, and declared they must give up before they reached the stream which saved the whole party from the horrible fate which stared them in the face. Being warned of the consequences, however, the latter persevered.

The animals would go to the water casks, draw out the bungs with their teeth, and gnaw at the bung-holes. The mercury stood at 100° in the shade. The last day but one the camels bellowed continually, owing, probably, to their sufferings from thirst. Still, they bore the hardships and fatigue of the terrible march well. On the day that water was discovered, the camels manifested a knowledge of the nearness of water ten miles before they reached it, by increasing their speed so that they had to be held back. The water was the head of San Francisco creek, at Camel's Hump mountain. The next day camels were sent back with water to the abandoned mules. One of the mules in camp died, and the rest looked badly. Several of the men were sick.

It appears, then, that the camels have fully vindicated their reputation for endurance and usefulness in their new home. The mules, also, held out remarkably well, but water was dealt out to them for two days after the camels got their last drink at Pecos.

Ventilating Waterproof Cloth.

India-rubber and oilcloth capes and coats, although perfectly waterproof, are unfit for wearing during warm rainy weather, because they retain the perspiration and prevent the necessary ventilation required for the body. The best light capes for soldiers and travelers when marching during wet weather, are made of what is called "Tweed cloth," prepared as follows: Take 2 lbs. 4 oz. of alum, and dissolve it in 10 gallons of water; in like manner dissolve the same quantity of sugar of lead in a similar quantity of water, and mix the two together. The cloth is immersed for one hour in the solution, and stirred occasionally, when it is taken out, dried in the shade, washed in clean water, and dried again. This preparation enables the cloth to repel water like the feathers of a duck's back, and yet allows the perspiration to pass somewhat freely through it, which is not the case with gutta-percha or india-rubber cloth.

The sulphate of lead is formed in this manner, and enters into the pores of the cloth. It is an insoluble salt; hence, the reason why it makes the cloth waterproof, while, at the same time, there is sufficient room in the interstices to allow the perspiration and heat from the body to escape.

Tweed cloth is light, and not expensive; it is also soft and pliable, and capable of being rolled up into small bulk without permanent wrinkles being formed in it. We have frequently prepared cloth in this manner, and have found it to answer an excellent purpose in rainy weather; while at the same time, in color and appearance, it does not differ from unprepared cloth.

War News and Descriptions of all New Implements of Warfare.

The Scientific American will give a weekly summary of all passing events pertaining to the war, and every number will contain, in addition to its illustrations and descriptions of all new and important inventions in the mechanical and industrial arts, engravings and descriptions of all new and important inventions of shot, batteries, ordnance, camp bakeries, fire-arms, &c., which cannot be found in books or in any other paper.

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Distribution of Papers to the Soldiers.—We would remind our cotemporaries that a very acceptable service can be rendered to the soldiers of our army by the distribution of good reading matter among them. We have been sending several hundred copies of the Scientific American, for a few weeks past, to the troops in the barracks opposite our office in the Park, and purpose to continue the practice. We purpose also to forward a number of copies to the several regiments located in Washington, and other portions of our country, every week as a gratuity. We would suggest to our brother publishers throughout the country to do likewise. After the drill duties of the day are over, the soldiers in camp are not only gratified to have something to read, but are morally and intellectually benefited in so doing, and we hope publishers generally will heed our example and furnish our soldiers with abundance of good reading matter.

Louis XIV. of France, upon setting out on his disastrous campaign against the Dutch, had inscribed upon his cannon "The last argument of kings."

How Swiss Cheese is Made.—The manner in which Swiss peasants combine to carry on cheese making by their united efforts deserves to be noted. Each parish in Switzerland hires a man, generally from the district of Gruyére, in the canton of Freyburgh, to take care of the herd and make the cheese; one cheeseman, one pressman or assistant, and one cowherd, are considered necessary for every forty cows. The owners of the cows get credit in a book for the quantity of milk given by each cow daily. The cheeseman and his assistants milk the cows, put the milk all together, and make cheese of it; and at the end of the season each owner receives the weight of cheese proportionable to the quantity of milk his cows have delivered. By this coöperative plan, instead of small-sized, unmarketable cheeses, which each owner could produce out of his three or four cows' milk, he has the same weight in large, marketable cheeses, superior in quality, because made by people who attend to no other business. The cheeseman and his assistants are paid so much per head of the cows in money or in cheese; or sometimes they hire the cows, and pay the owners in money or cheese. A similar system exists in the French Jura.—*Notes of a Traveler.*

The Origin of Rock Oil.—We have received a communication from a correspondent in Illinois arguing that rock oil was formed in the plants as they grew, and not by a new combination of the elements, as these were released in the decay of the plants, as suggested by Dr. Stevens. We have shown the communication to Dr. Stevens, and he makes this reply: "Vegetable oils are produced only in flowering plants; never in seaweeds. No flowering plants are found in the geologic formations below the carboniferous; and the rock oils of this country occur below the carboniferous, in the devonian; in which the plants are mainly fucoides, or seaweeds." We suppose that the combination between hydrogen and carbon, which constitute petroleum, is formed in the growth of the plant, but other elements, or at least one other element—oxygen—also enters into the combination, producing substances which are not oil. Then in the decomposition of the plants, by the operation of natural chemical forces, the other elements are removed, leaving the hydrogen and carbon in that kind of combination which forms rock oil.

Wrought Iron Cannon.—Much attention is now given, both in this country and in Europe, to the manufacture of cannon of wrought iron, the object being to reduce the weight, and so render them more easy of locomotion or transportation, and enable them to be worked with greater facility. The celebrated Armstong (English) gun is an example, being of wrought iron with a steel lining. It may not be generally known to our readers that the first cannon ever made (A. D. 1341) were of this metal, having been composed of longitudinal bars fitted together, side by side, in cylindrical form, with rings shrunk upon them. Some of these are now preserved as relics in the armories of Europe. We have seen a beautiful specimen of workmanship recently made in this country, of a gun of somewhat similar construction, the only difference being that the longitudinal bars were dovetailed together. The earliest record we have of cast guns was nearly two hundred years later than the date above mentioned.

Charcoal for Turkeys.—A correspondent of the *Southern Rural Magazine* says that he has made successful experiments in feeding turkeys with charcoal. He took eight of these fowls and put four in each of two separate pens, and fed them alike, with meal, boiled potatoes, and oats, with the exception that one set had a pint of pulverized charcoal daily, while the others had none. They were all killed on the same day, when it was found that those which received the charcoal averaged each one and a half pounds more than the others, and their flesh was more tender and pleasant.

[Advertisement.]

$1,000 Rifle Cannon Challenge.

We challenge the proprietors of any muzzle-loading Rifle Cannon and Projectile, of this or any other country, to a trial within 300 miles of this city, not less than 100 shots to be fired, and 50 of them to be shell; distance to be agreed upon. Judges to be mutually selected from competent military authorities. If, after trial, any other projectile is decided to be practically superior to ours, we will pay the proprietor $1,000.

HOTCHKISS & SONS,
No. 80 Beekman-street, New York.

N. B.—The above challenge was published in the New York *Herald* for three weeks in December, 1860, and is still open. H. & S.

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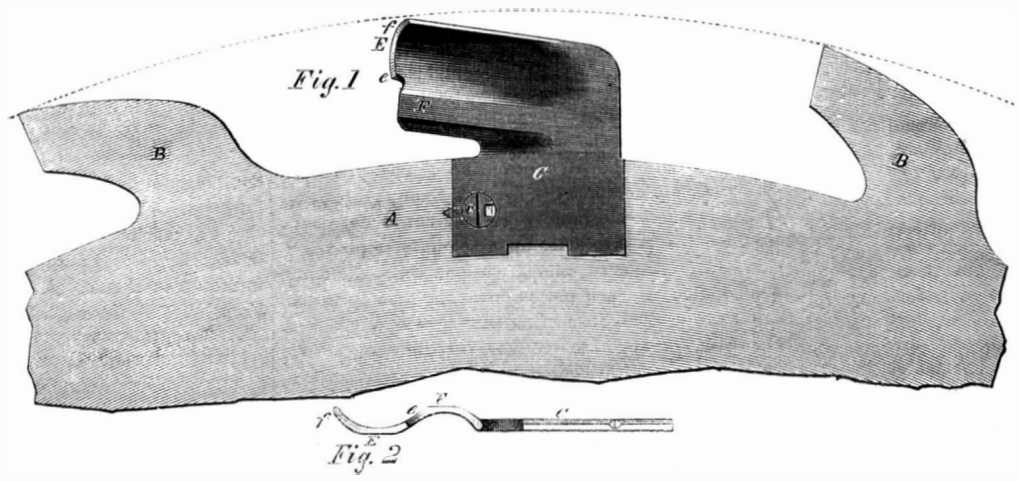
Improved Planing Saw Tooth.

The idea of so forming the teeth of saws that they would plane the surfaces of the boards in the operation of sawing has occurred to the minds of many men, and efforts have been made to reduce the idea to practice; but the difficulties in the way have not hitherto been fully surmounted. We now, however, present an illustration of a tooth to be attached to an ordinary circular saw, by which it is thought that the long-sought object is successfully accomplished; and a bit of steel weighing less than an ounce will perform the work and take the place of an expensive and cumbrous planing machine.



BROWN'S IMPROVED PLANING SAW TOOTH.

Fig. 1, in the annexed cuts, represents a portion of a circular saw, with the teeth, B, of the ordinary form. The improved tooth, C, is made separately, and is fastened in the saw by a dovetailed joint and binding screw, *c*, in the manner represented. That portion of the tooth which projects beyond the saw is swaged into a form somewhat like the letter *s*, but with flattened sides, as is more clearly shown in Fig. 2. Each half of the edge is beveled on its hollow side, and the exterior of each curve is flattened, for a short distance, parallel to the plane of the saw, as shown at the letters, E F. The width of this flattened space should be varied according to the number of the improved teeth which are used in the saw, but where only one is used (which is sufficient) it should be made a little more than equal to the amount of feed at each revolution.

The tooth being secured in the saw with its exterior a little within the points of the cutting teeth, as shown in Fig. 1, and the lumber being fed along; the cutting teeth, acting in the usual manner, open a narrow kerf always a little in advance of the planing teeth. As the latter enters the kerf, the curved portions, *e f*, of its edge, immediately exterior to the flattened portions, act as gouges, widening the slit and partly smoothing its sides. On the next revolution the lumber has been fed forward sufficiently to cause the gouge portions, *e f*, to cut away a new portion, while the plane portions, E F, pass immediately in the paths described by *e f* at the preceding revolution, smoothing off any irregularities which may have been left, and giving the surface upon each side of the kerf a smoothed and finished appearance. The cutter acting upon both sides at once has no tendency to spring the saw, and cause ridges in the work; and as it bears for a distance behind the cutting edge, all spring is prevented, even when passing through knots or other parts of unequal hardness. The S-form allows the chips to pass freely through from each cutter without clogging, while it gives a very stiff tooth with so little weight as not to disturb the balance of the saw.

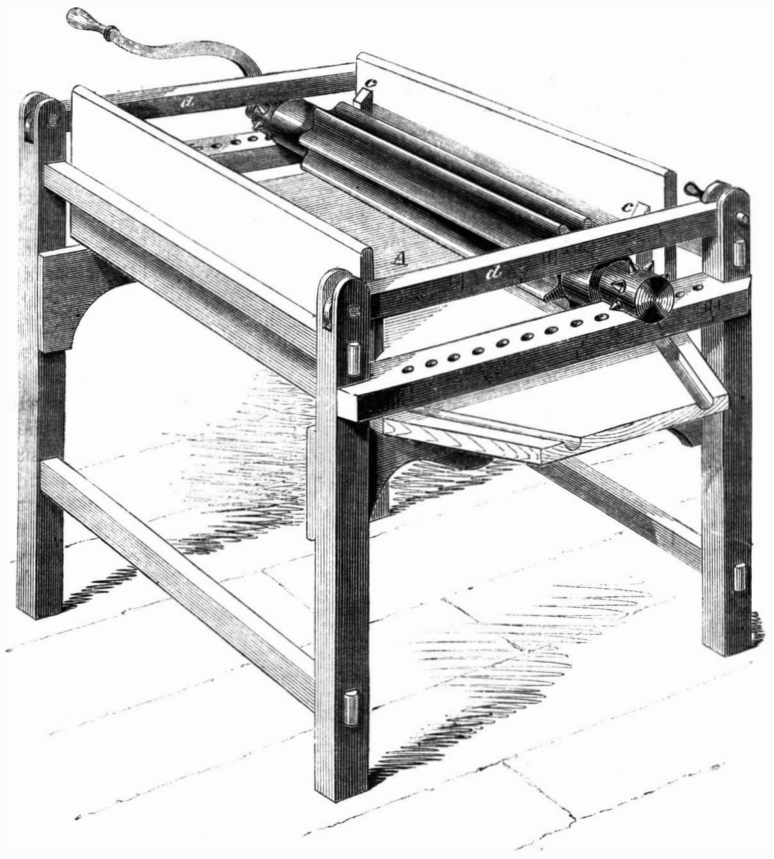
The inventor says that the boards smoothed with this tooth will bear a comparison with those coming from an ordinary planing machine.

The patent for this invention was granted Jan. 8, 1861, and further information in relation to it may be obtained by addressing the inventor, Ira S. Brown, at Hopkinton, R. I.

A Novel Battery.—The Philadelphia *Ledger* states that the determination to reconstruct the bridges on the Philadelphia, Wilmington and Baltimore railroad, destroyed by a mob from Baltimore, has led to the construction of a railroad battery by the Federal government, at the locomotive works of Baldwin & Co., in that city. One of the long platform baggage cars has been fitted with sides and top of thick sheet iron, the sides having port holes and loop holes for musketry. A turn-table has been arranged, on which a rifled cannon is to be placed. The carriage for the gun is so constructed that it can be fired from any angle, and from any one of the port holes in the sides or end of the car. In place of shot or shell for the cannon, pieces of iron punched from locomotive boilers will be used as loads. This car is to be placed in front of a locomotive, and with fifty men inside, armed with Minié rifles, and seamen to work the cannon, there are but few more terrible instruments of destruction.

Improved Butter Worker.

The aggregate of the labor expended each day in working butter is enormous. The unctuous mass is pressed with a heavy wooden spoon, pounded, turned, pressed again, and beaten for a long time, before all the butter milk is extracted; and in all the country a great many of these operations are performed. We present here an illustration of a simple little apparatus by which this great labor may be materially diminished, while at the same time the work is more effectually accomplished.



WOODARD'S IMPROVED BUTTER WORKER.

A smooth board, A, provided with channels at the side, is placed at a slight inclination to carry off the butter milk, and at a short distance above this board a fluted roller, B, is rolled back and forth by means of a crank; the butter to be worked being placed upon the board, and pressed and kneaded by the passage of the roller. By this operation channels will be formed in the upper surface of the mass inclined lengthwise, which will carry off the butter milk with great facility. To prevent the flutings of the roller from constantly entering the same channels in the butter, a transverse motion is given to the board, A, at each passage of the roller equal to one half the distance of the grooves apart. This is effected by rigidly securing to each side of the board two standards, *c c*, which are pressed by the roller at the end of each transit, thus slipping the board alternately to the right and left. The passage of the roller is secured and controlled by means of pins in each of its ends, working in tapering holes as shown. The roller is held down to its work by transverse bars, *d d*, which are secured over its smooth ends by means of pivots and pins, so that it may be readily removed for the purpose of being cleaned. In place of the standards, *c c*, for moving the board sideways, upright boards, extending the whole length of the board, A, may be employed; thus making a watertight trough in which the butter is placed to be worked.

The advantages of this machine are: 1st, it can be made almost wholly of wood; 2d, it requires but little skill for its construction, making it a very cheap apparatus; 3d, it is simple, and easy kept clean; 4th, it is very efficient in its operation.

The patent for this invention was granted March 19th, 1861, and further information in relation to it may be obtained by addressing the inventor, P. G. Woodard, at Waterford, Pa.

To Unite Stone and Glass.—M. Bru, curator of the museum at Narbonne, has discovered that silicate of potash possesses, in the highest degree, the property of uniting surfaces of stone, glass and pottery. It is applied with a brush to the surfaces which it is desired to bring into contact, and in a few days acquires a great solidity. It appears that the same material can also be successfully used in joinery, and for all the purposes to which common glue is applied. This discovery, which promises to be of considerable importance, was announced by M. Bru to M. Figuier, the editor of *L'Année Scientifique et Industrielle*, the volume of which work for the present year contains, at page 481, a paper on the subject, and a letter from M. Bru to the editor.—*London Builder.*

The London *Engineer* says:—"Stone-working machinery, the introduction of which the stone masons have so long resisted, is likely to be brought into use at last, in consequence of the strike of the Edinburgh masons. At a late meeting of the masters, a committee was appointed to ascertain the cost and capability of machinery for cutting and dressing stones, and to prepare, for the consideration of a future meeting, the prospectus of a company for the purpose of working stones by machinery. Stone, as is well known, is readily cut by blunt tools, and in America stone-working machinery is in extensive use. Many heavy monolithic columns have been turned there for the Capitol, at Washington."

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VOL. IV. NO 21.....[NEW SERIES.]....*Seventeenth Year.*

NEW YORK, SATURDAY, MAY 25, 1861.

SUBJUGATION OF THE SOUTH.

This term is made use of by the leaders of the Southern revolution to arouse the masses of the people to take up arms against the Federal government. Thinking men cannot be deceived by such a cry as this, however much it may influence the baser passions of the ignorant. The simple explanation of this whole matter is that the United States government, whether headed by Abraham Lincoln, John C. Breckinridge or Stephen A. Douglas, exercises, by virtue of the constitution, supreme authority over every State and Territory; and every Governor of every State, and every Federal and State Judge, when about to enter upon the duties of office, are required to support and uphold, under oath, the constitution of the United States. The very organization of the Federal government was based upon this idea, and all State governments, and all State courts, are held in subordination to this supreme power. Were this not so, a State at any time could arrest the execution of the Federal laws, and the government would be completely at the mercy of a State convention or a State legislature. If, on the theory of secession, a State may withdraw at pleasure, then there could be no possibility of making and faithfully carrying out treaties with foreign powers, protecting citizens in foreign lands, borrowing money for any purpose, and exercising those functions that alone belong to a general government. No; it was the intention of the States, when the constitution was adopted, to form a *perfect Union;* and, furthermore, to clothe the government with power to execute the laws of Congress against all violators. This is all that the Federal government is now trying to do. It says to the Southern people, "Obey the laws, and you shall have, as heretofore, all the protection to life and property that you desire." The government could do no less; it seeks to do no more; and all this talk about subjugation is mere claptrap. If South Carolina will but obey the laws, as the great States of New York and Pennsylvania are now doing, not a single right belonging to her people would be withheld. She will have a Governor of her own choice, two Senators in Congress, and her proper quota of Representatives. Federal judges will execute the laws, the mails will be carried as usual, her slave property respected, and insurrection suppressed, if need be, by the Federal government. Could anything be more reasonable? Could a reasonable people ask for anything more? Is not the Federal government just as good as the government of the Confederate States? What advantages does that government possess over the one we now have? We cannot discover the slightest gain, but we do see clearly that the moment a State secedes, that moment confidence in her future good behaviour ceases; peaceful citizens feeling a sense of insecurity, either flee or rush to arms, business stops, property of all kinds sinks in value, the State bonds become almost worthless, anarchy and confusion prevail, and a permanent injury is inflicted upon all the interests of the State. In short, secession is ruin; and we venture the assertion that no seceded State can ever enjoy the same amount of prosperity and security under any attempted new government; besides, the very theory upon which the Confederate States have organized a provisional government is destructive of every principle of stability and permanence, and to maintain themselves as a power to be respected at home and abroad, the people must undertake to support a civil, military and naval power capable of commanding respect from powerful nations. This will necessarily entail a heavy system of taxation, and instead of feeling relieved by reason of secession, the burdens of the people will be augmented, and their abilities to resist oppression will, in a great measure, be swallowed up.

WAR AND INVENTIONS.

Times of war have generally been times of great mental activity; fruitful in novel ideas and inventions. During the fierce intellectual ferment that introduced and accompanied the first French revolution, more important inventions were made by the French than that nation had produced in centuries. It was then that those two paper manufacturers—the brothers Montgolfier—invented balloons, by which, for the first time, the ponderous bodies of men were lifted up into the air above the clouds. In 1794 Barrère made his report in favor of Chappe's plan for transmitting ideas rapidly to a great distance by means of posts with arms upon them to be placed in different positions to express various signs. Though the populace of Paris pulled down the first apparatus that was erected, suspecting that it was a device of the "aristocrats" to convey intelligence to the enemy, the tough inventor persevered, and the TELEGRAPH took its place among human affairs. It was a member of the National Assembly, the benevolent Dr. Guillotin, who contrived the plan for beheading criminals instantaneously in order to save them from the sufferings attendant upon the ordinary modes of execution. In his speech, advocating the adoption of his plan, he remarked, "We will cut off your heads, Messieurs, without hurting you in the least," which caused a general laugh; the members little thinking that nearly all of their heads would in fact be sheared off by the doctor's sliding knife. To Guillotin's lasting grief, his own name was given to the bloody implement, with which it must be associated through all subsequent time. It was during this same period of bold and active thought that was perfected that admirable system of weights and measures, the adoption of which in this country we have long advocated; a reform that we hope to see accomplished before the conclusion of the present war.

Periods of war in other nations have not been less marked by fecundity in inventions than those of France. The twenty years in which England was fighting against the French revolution produced more inventions in England than twenty centuries had before. The activity of mind which resulted from the furious contests of the Italian republics of the Middle Ages, not only gave the world the barometer, the pendulum and the telescope, but it also discovered the Western hemisphere, and demonstrated the real movements of the solar system. Going further back in history, we find that many of the inventions which came from the fertile intellect of Archimedes, related to the production or the improvement of military engines.

It is, however, to be remarked that the inventions resulting from the intellectual activity which generally accompanies a period of war are not confined at all to warlike implements, but are found in every department of science and art. The great war which has been inaugurated in our midst will doubtless produce many wonderful developments, and it will be very interesting to observe, whether, among these, will be a greater degree of activity on the part of inventors even than that which has marked our past periods of peace.

DERANGEMENT AND ADJUSTMEMT OF SHIPS' COMPASSES.

This is a most important question, and the article which appeared on page 249 of the present volume of the SCIENTIFIC AMERICAN was designed to attract more public attention to it than it has hitherto received.

Captain R. B. Forbes, of Boston, a man well qualified to speak and write upon the subject, has addressed us a communication, in which he states that "compass deviations, the result of local attraction, is a subject relating to the safety of navy steamers and sailing vessels, which, while it has attracted the attention of learned men in Europe, and particularly in England, is still a matter of debate and uncertainty. The Admiralty ignore all magnetic compass corrections, and depend entirely upon daily observations for the accuracy of their courses, which is all very well in fine weather." He refers us to an article of his on this subject published in the Boston *Commercial Bulletin*, in which we find a considerable amount of useful information.

It is stated that the derangement of ships' compasses has puzzled the wisest minds, as local attraction exists in all vessels where there are large masses of hammered iron, and more in propellers than paddle wheel steamers. The most scientific men in England—Faraday, Barlow, Airey Scoresby, Gray, and others—have failed to provide a sure remedy for the deviation of ships' compasses. He says:—

They have devised certain expedients by which a ship may be guided with considerable safety, the most common and most reliable of which is to elevate the compass so far as to place it out of the way of the local attraction. This expedient renders the compass subject to variations and to accidents almost as inconvenient as a compass that has a variable error, such as the vibration of the machinery, and the difficulty sometimes of seeing the card. Indeed, the difficulties, especially in iron ships, are so great that no dependence can be placed on the course steered, unless it be verified daily by azimuths, amplitudes, celestial observations, noting the bearing of the sun when on the meridian, &c., all of which means are subject to errors, and are not always attainable by reason of thick weather and rough seas.

Airey condemns as dangerous the usual method of correcting the course steered by a compass in error from local attraction, namely, by a table of errors; and it must be obvious to every intelligent navigator that where a correction is applied, differing in amount for almost every point of the compass, serious errors will be likely to arise endangering the ship in close navigation by night, when buoys, landmarks, &c., cannot be seen, and where the compass and the lead are the only guides.

He also states that there are several persons in England who profess to have overcome the worst effects of a local attraction in a high northern latitude by placing magnets and soft iron in the vicinity of the compass, so that it is nearly right on the cardinal points, and for the points where it is not right, they make a table showing when it is out. These errors are variable, and on getting into a high south latitude they are so much so that the compass is entirely useless unless corrected daily by celestial and other observations. It also happens frequently that, although a compass is correct when the vessel is heading in one direction, it will be in error when the ship heads in another direction.

Captain Forbes states that a method of arranging compasses has been discovered by Captain G. Morris, whereby the compass will correct itself without any table of errors, and in all latitudes. Captain Morris has adjusted compasses in three ships of the American navy, and in quite a number of merchant steamers, several of which have iron hulls. We understand that Captain Morris now resides in this city, and that he has applied his method of compass adjustment to most of our river and sound steamers, such as the *Bay State*, *Empire State*, *Metropolis*, &c. His method of obviating derangement of the compass is not by correcting the compass itself, but by neutralizing local attraction within the ship or boat within a certain distance of the compass. Every improvement which tends to insure the safety of our steamships deserves general and prompt attention.

ALLEGIANCE.

The question comes up, do we owe our allegiance first to the State in which we reside or to the Federal government? We answer unhesitatingly that our first political duty is to the government. Henry Clay declared in the Senate, in 1850, that "If Kentucky to-morrow unfurls the banner of resistance, I never will fight under that banner. I owe a paramount allegiance to the whole Union—a subordinate one to my own State."

The gallant General Harney, of Missouri, has lately addressed a noble and patriotic letter to the people of that State, in which he declares that: "As an officer of the army and citizen of the United States, I consider my primary allegiance to be due to the Federal government, and subordinate to that is my allegiance to the State. This, as you are aware, has been the concurring opinion of the most eminent jurists of this country. It was the judgment of the Court of Appeals of South Carolina, in the case of Hunt, where the subject was discussed with matchless ability. In that case, the highest court in South Carolina deliberately declared that the soldier's and citizen's primary duty of allegiance is due to the United States government, and not to the government of his State."

General Scott has, for the third time, taken the

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oath of allegiance to the United States, and the officers of his staff have followed his example. He first took the oath when he entered the service, and the second occasion was when he assumed command of Fort Moultrie, in nullification times.

THE PEOPLE GOVERN.

It is frequently alleged that ours is a government of the people; and when the people don't like it, they will no longer submit. True; and it is no less so of all governments. When the people will the overthrow of the British throne, it will be hurled into the dust; but whenever a minority seeks to overturn that throne because they happen not to like the sovereign, the strong arm of the government will be wielded to make them obey the constituted authority.

It must be plain to all that if factions can control the government, and bid defiance to it at will, then there can be no security or stability for either life or property. General Washington, the revered Father of his country, said:—

If any have just cause to complain of grievances, we should redress them; but if complaints are inconsistent with the principles of freedom and constitutional liberty, we should show them that there is no remedy, and use the powers of the government to suppress any passionate manifestations of their dissatisfaction, in violations of the public peace and constitutional law.

And, again:—

If the laws are to be trampled on with impunity, and a minority, a small one, too, is to dictate to the majority, there is an end put, at one stroke, to republican government.

This is the doctrine of the Fathers, and is the only one upon which a sound and stable government can rest. Jefferson Davis, however, in his late address to the Confederate Congress, scouts this doctrine, as follows:—

So utterly have the principles of the constitution been corrupted in the Northern mind, that in the Inaugural Address delivered by President Lincoln in March last, he asserts as an axiom, which he plainly deems to be undeniable, that the theory of the constitution requires that in all cases the majority shall govern.

Not only are the people of the North *corrupted*, on this theory of Mr. Davis, but thousands of true-hearted men at the South to-day are affected in like manner; and are actually willing to redress all grievances at the ballot box and in a legal manner.

GENERAL JAMES' PROJECTILE.

In our editorial comments upon cannon shooting, published on page 297 of the present volume of our paper, we referred to the fact that objection had been raised to the Armstrong projectile, and also to that of General James, from the "leaden bands flying obliquely from the shot," thus endangering the soldiers of the army by whom the gun is used. Our attention has since been called to the official report of Captains Maynadier, Thornton and Anderson, of the trial at Watch Hill, in November last. Upon this point, they use the following language:—

It has been urged as an objection to this kind of projectile, that the packing separates from it on its leaving the bore, and scatters fragments which may prove hurtful to men in front or near the guns. The observations of the Board on this point lead them to the conclusion that there is no more force in this objection than will apply, for the same reason, to the sabots of fixed ammunition or the junk wads of heavy cannon.

We certainly had no intention of doing any injustice to the value of General James' invention, but our information was obtained from one who was present at the trial. What we want to get at, and as speedily as possible, is which projectile is most efficient for all the purposes of war. We care not whether it be James', Armstrong's, Hotchkiss', or any other less humble man. Give us the best, by all means.

True Honor.

Some apprehension is expressed at the South lest the banks in the free States may dishonestly refuse to honor drafts on the balances left in their drawers. The following dispatch has been addressed by the president of one of our leading banks here to a firm in New Orleans:—

New York, May 4, 1861.

MESSRS.———, New Orleans—Gentlemen: I have yours of —— —. I telegraph you to-day (according to your request) as follows:—Under no possible circumstances will balances due you be confiscated here.

You say in your letter you know nothing of our political sentiments. On that subject, it is perhaps only necessary to say we have not forsaken our principles, our country, or our God. Yours, with respect.

FORTRESS MONROE.

At the present time the following description of Fortress Monroe, which we find in the Norfolk *Day Book*, will interest many readers:—

Fortress Monroe is a strong fortified garrison situated on that point of land formed by the extreme western bank of the Chesapeake, and the extreme eastern bank of Hampton Roads, and at the junction of the two waters. It was discovered, during the war of 1813–14, that Chesapeake Bay was the key of all the waters of Virginia and Maryland, and all who are at all familiar with the history of the country, will remember that British vessels came into Hampton Roads, and not only took the town of Hampton but threatened to apply the torch to Norfolk, that, phœnix-like, had sprung from the ashes of a former war with that power. Peace was declared in 1815, and when the next Congress met they took into consideration the subject of coast and harbor defenses; accordingly a Board of engineers was appointed, and an appropriation made for the prosecution of such plans as might be decided upon.

About this time the grand army of Napoleon was quiet, and several of his principal officers made our republican country their home; among them was General Bernard, an experienced soldier, and one of the most skillful engineers then existing. He was accordingly invited to assist in the work of arranging our system of coast and harbor defense, and in 1816, in company with several American officers, projected Fortress Monroe and Fort Calhoun, more generally known as the "Rip Raps." The work was laid off and both forts commenced in 1819. From that time up to this there has been more or less work going on at Fort Monroe, and while that work is sufficiently advanced to be placed in a state of defense, it is far from being finished. The extent of the work may be judged fron the fact that it is over a mile around the ramparts; the wall covers a space of twenty or twenty five acres, and there are about fifteen acres inside of the garrison.

The casemates commence in the vicinity of the postern, behind the water battery, and extend, with little intermission, to the arched doorway. On either side of that entrance are casemates, which are used as quarters for the officer of the day, guard house, and barracks for the guard. Those nearest the portcullis have embrasures, which are intended to protect that point from attack. Indeed all the casemates are supplied with embrasures, behind which are mounted forty-two pounders.

On the ramparts, at those points where there are no casemates, are mounted guns upon wooden carriages, whose saucy-looking muzzles are plainly to be seen above the green turf that caps the fortification. At the extreme southern bastion floats the Stars and Stripes, while just below it, on the inside of the garrison, is a neat little Episcopal church, where the chaplain, Mr. Cheevers, still continues to offer up his prayers for the Union and the President. A deep moat surrounds the whole work; this moat is supplied with water from Mill creek, and while the gates are open ebbs and flows with the tide.

The water battery, like all the masonry on this fort, is a beautiful piece of work; it is built of stone, and is sufficiently thick to withstand any shot that may be projected against it from the bay beyond. It is finished with casemates, the arches of which are turned with brick and rest upon granite columns in the rear. This battery has forty-two embrasures, and is supplied with a like number of forty-two pounders, which, like all the rest of the guns in the garrison, are fully mounted and ready for action. It covers all that face of the garrison that fronts upon the channel of the bay, and is only intended as a means of offense and defense when attacked by a force on the water. This portion of the work, like the ramparts, is covered with a green turf, and presents a beautiful and pleasant promenade in the summer afternoons.

At the upper or northern extremity of this battery commences a redoubt or breastwork which extends around to the point of the bastion where the magazine is situated; in the middle of this redoubt is a sally-port or postern that leads out to an outer work (not yet finished) that is intended to protect the fort on the land side. From the water battery to the magazine is decidedly the weakest portion of this fortress, and a well-organized force of one thousand men could readily carry the fortifications at this point. Besides the fact that there are no casemate guns on these two faces, the gates that supply the moat with water are on this side, and at low tide might be closed, to prevent the water from coming in on the change of the tide, and thus could a land force reduce the draft of water to such an extent as to enable them to wade across and scale the walls, which, of course, could only be done under a murderous fire. The gun from only one shoulder could be brought to bear upon the scaling party, and that one, or even two, would be so depressed as to render their effect doubtful. Besides this, a storming party could reduce the garrison to submission in a short time, unless the elements conspired to furnish them with water, for there is not a spring, or a well, or a pump on the works, but, like the good people of Norfolk, the soldiers at Old Point have to depend on the clouds for their drink.

We were led to the above remarks because of the fact that Fortress Monroe is considered impregnable, but such is not the fact; it lacks much of it as it now stands, and even if it was completed, we give our idea of the work when we remind our readers that Sevastopol and Gibraltar fell before a resolute enemy.

Cavalry Grapnel.

This is a newly-invented weapon of warfare, and is designed to render cavalry vastly superior to infantry. It is an admitted fact in the science of war that infantry formed into a square, or in mass, and standing firm and unbroken, can defeat an equal number of cavalry, each being armed with the ordinary weapons. This fact being fully demonstrated upon many a well-fought field in the last half century, the most notable of which was the battle of Waterloo, where the French cavalry repeatedly charged the squares of English infantry, and were uniformly repulsed, the squares standing firm and unbroken. This firm stand of the infantry and the uniform repulse of the cavalry were doubtless the main cause of the defeat of the French at that celebrated battle, contested between the best cavalry and infantry of any age, and commanded by the greatest generals of the world. A man and horse, acting as one, have the strength and speed of several men, and ought, if properly armed, to be competent to the defeat of several men. The cavalry grapnel is a new weapon adapted to this superior strength and speed, and a regiment of horse armed with this destructive weapon, and well skilled in its use, can easily defeat four times their number of infantry, mowing them down like grass before a scythe. This weapon can also be used by cavalry against cavalry, and even infantry might use it against infantry with great destruction. The grapnel was invented in one of our Northern States, and 100,000 have been recently manufactured for a European government, for the arming of cavalry. The present widespread rebellion in our own country caused the inventor to offer them to our government. They were submitted to the proper department and approved of, and purchased. It is expected that the President will shortly call into the service of the United States 50,000 cavalry, to be furnished witb the grapnel as an additional arm. With this destructive weapon, they will be able to cut up or annihilate 200,000 of the best infantry that ever entered a field.

[We copy the above from one of our daily papers; it appears to be going the general rounds as something wonderful for war purposes. It is something wonderfully ridiculous. A regiment of well-drilled rifle infantry could annihilate any regiment of cavalry before the latter could come up and throw their clumsy grapples among them! We recommend the lasso as a substitute for the grapnel, or, what would be equally effective, blacksmiths' tongs.—EDS.

MAJOR ANDERSON.—This distinguished officer, whose fidelity to the old flag has been so signally displayed in his gallant defense of Fort Sumter, will [illegible], it is said, be assigned to the command of the [illegible] Kentucky troops mustered into the service of the [illegible] government. Major Anderson has been promoted to the rank of Colonel, and will probably be appointed Brigadier General.

GOVERNOR MORGAN has appointed Hon. John A. Dix, of this city, Major General of the State forces. General Dix is a noble man, and has the advantage of a thorough military education, being a graduate of the West Point Military Academy.

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LETTER FROM OUR WASHINGTON HOUSE.

WASHINGTON, May 7, 1861.

MESSRS. EDITORS :—During the last week several regiments of the New York State Militia, quartered here for the defense of the capital, have gone into encampment, and are trying a few of the realities of soldier life. The Seventh are encamped on Meridian Hill, east of Columbian College, and in spite of the inclement weather to which they have been subjected, observe the rules of camp life with great exactness. It is difficult to gain admittance to the ground, and still more to get away, so strict are the soldiers on guard. One is only allowed to visit a friend in camp when off duty. The ground chosen is pleasantly situated, but so flat, that it is completely saturated by the heavy rains. Each tent has a plank floor, however, and many of them are carpeted, and some furnished with chairs and tables. The tents are arranged in the usual order, in double rows back to back, with wide streets between. The regiment parades every day when the weather permits. We learn that some members have left the Seventh regiment, and connected themselves with the Seventy-first, the latter having entered the service for three months instead of but one.

The Seventy-first are still quartered at the Navy Yard, which is regarded by many as the post of greatest honor, being subjected to more danger of attack than any other. They are vigilant and energetic in the extreme, and drill most assiduously, as indeed do all the troops in the city.

The entire New Jersey brigade, numbering 3,200 men, arrived from Annapolis in three trains from Sunday morning to last evening. The first detachment, comprising the First and a part of the Second regiment, reaching the city before day on Sunday morning, and some hours before they were expected, found no one to conduct them to their quarters, and were compelled to march for an hour and a half through the drenching rain in search of shelter, and were after all compelled to seek repose on bare floors, without any fire or change of clothing. From conversation with one of the officers this morning, I learned that this mistake was not attributable to any neglect on the part of the authorities here, but rather to a lack of information as to the movements of the troops. I also gathered some interesting items respecting their journey. He stated that there was no open disunion demonstration at Annapolis, but that the male inhabitants looked on them with anything but favor. With the ladies, however, it was widely different. They retired within their houses, so as to be seen only by the passing soldiers, and greeted them by the waving of handkerchiefs, and silent tokens of applause. Some of the officers inquired of a little negro boy, whom they hired as a guide, if there were any secessionists about, to which he replied that he didn't know; but that there had been a secession flag up town, but when the Seventh regiment came they took it down, and it had not been put up since.

Colonel Ellsworth's Firemen Zouaves are causing some consternation to our quiet citizens, and much trouble to their estimable commander. It is very evident that doing nothing formed no part of their intention when they enlisted. The Colonel is taking the most prompt and effective measures to single out all who are disorderly, and send them back to "the place from whence they came;" but in spite of all his efforts, we hear daily of some of their mischievous and original freaks. Two of them to-day got into quite a controversy on Pennsylvania Avenue, because they could not agree whose particular duty it was to "*take Jeff. Davis' scalp.*" One of them declared that his knife was made expressly for that particular job; but the other insisted that his was equally well adapted for it, and they actually made quite a quarrel over it! These troops are quartered in the south wing of the Capitol, where are also some of those from Massachusetts. Some nights ago, the Zouaves convened a "called session" of the House at a most unseasonable hour, and after transacting some other business in their own style, unanimously passed a resolution that the gallery must be cleared, and actually carried it into effect, in spite of the protestations of the quiet Bostonians who had long before "turned in" for the night. The Zouaves regard themselves as specially called on to watch over their Massachusetts friends, and one way of doing this is so novel that it deserves special notice. They will climb to the top of the lofty building, immediately above where the orderly Massachusetts sentry paces to and fro, and so sure as he lingers to rest on his post, a brick is dropped within six inches of the end of his nose, and crashing down to his feet, effectually secures him against drowsiness for an hour to come.

At the Navy Yard the prospect of war has caused everything in a state of great activity, but this is only in keeping with the energetic efforts progressing in all the loyal parts of our noble country to crush out the foul treason which would destroy at once our prosperity and our happiness.

Joseph J. Coomb, Esq., of the District of Columbia, has been appointed to the office of Examiner-in-chief, completing the Board of Appeals in the Patent Office, and Dr. Thomas Antisell has been *definitely promoted* to the position of Principal Examiner, in which capacity he has acted for years past as head of the chemical department.

War Operations in the West.

The great West, with its teeming millions of brave and hardy sons, are fully awake to the momentous issues that press upon them. The government, it is said, has already received proffers of service of 250,000 men west of the Alleghenies; and this immense multitude is ready for instant service at the first tap of the drum. Adjutant General Carrington, of Ohio, has ordered out 1,000 companies, comprising a total force of 100,000 warriors. The Governor of Ohio has appointed Captain George B. McClelland Major General and Commander-in-Chief of the forces to be raised by Ohio in the present contest. This appointment is the best that could possibly have been made. General McClelland is a Pennsylvanian by birth, and was formerly one of the most eminent and skillful officers in the United States army. General McClelland entered the United States Military Academy as a cadet from Pennsylvania in 1842, and graduated at that institution with distinction in July, 1846. He was immediately appointed Brevet Second Lieutenant in the corps of Engineers, and during the Mexican campaign was actively engaged with his corps. He was breveted First Lieutenant for his gallant and meritorious conduct in the battles of Contreras and Cherubusco—the latter the hottest contested battle in that war—August 20, 1847. He was subsequently appointed Brevet Captain for gallant conduct in the battle of Molino del Rey, September 8, 1847, but declined the honor. He subsequently participated in the successful assault on the Castle of Chepultepec, September 13, 1847, for which he received an honorable brevet. He commanded a company of sappers and miners in 1848. He was afterward appointed one of the three commissioners to visit Europe during the time of the struggle between the Allied Powers and Russia. Enjoying ample facilities for inspecting all the operations in both the hostile camps, he was enabled to render himself personally familiar with all the details, and every possible aspect of modern warfare on a gigantic scale. His report to the government of the results of his observations forms one of our most reliable and interesting works. For several years past he has been actively engaged in superintending extensive railroad operations in the Western States, to which pursuit he energetically devoted himself after his resignation. He is the translator and compiler of the "Manual of Bayonet Exercise for the United States Army."

At the southern termination of the Illinois Central Railroad and at the confluence of the Ohio and Mississippi rivers, is the city of Cairo, a point of the deepest interest at this moment. A large body of government troops are now holding the place, and are fortifying the levees with a battery of heavy artillery, sufficient, it is said, to defend the place against all attacks and command the rivers, while it would be next to impossible to land troops above, either on the Ohio or Mississippi side, in sufficient numbers to cause much trouble. It is reported that General Gideon J. Pillow has organized a band of desperadoes who propose to come down heavily on Cairo, and take it. This is easily said, but not so easily done; and we incline to the opinion that the sword of Gideon will be drawn in vain. If he expects to whip out the West, he had better petition for an extension of his mortal being.

The same enthusiasm is firing the hearts of the people of Indiana, Illinois, Michigan, Wisconsin, Iowa, Minnesota and Kansas, and regiments are actually forming. It was thought that a grand flotilla of gun boats and steamers would soon move down to Memphis, Tenn., and thus enable General Pillow to have the war brought to his own door, which would be a greater convenience than to go off to seek it up the river.

A STIRRING SCENE IN THE ILLINOIS LEGISLATURE.

On the 3d inst., just before the final adjournment of the Illinois Legislature, the two Houses assembled in the hall of the House of Representatives to sing the "Star Spangled Banner." The lobby and the "third House" were invited to participate in the singing, which was done with a hearty good will. The whole crowd rose to their feet, and sang that patriotic air *with an enthusiasm unbounded. At the close of* each stanza there was a general clapping of hands, waving of hats, and other manifestations of delight.

After the singing, on motion of Mr. Church, Judge Norton administered to the whole crowd the following oath:—

I do solemnly swear that I will support the constitution of the United States, and of the State of Illinois, and that I will defend the flag of my country against all assailants.

The Judge recited the oath in clauses, and the crowd repeated each clause after him, standing on their feet and holding up their right hands.

Speaker Cullom then delivered a valedictory address, and pronounced the House adjourned *sine die.* He then read a pledge that each member was requested to sign. It enrolls the Legislature as a military company, and pledges each to respond to the call of the Governor in defence of the country. Every member of the House who was present at the adjournment signed the pledge, including the octogenarian from Madison county, the venerable Cyrus Edwards, and Messrs. Baldwin, Jarrot, Turney, Scammon, Brown, McNeil, and others, who are gray-haired men.

Marine and Naval Operations.

The preparations for a complete blockade of all the Southern ports are going on with the utmost vigor under the direction of Commodore Stringham. The steam frigate *Wabash* is ready for sea. Her armament has just been finished, and is a heavier one than she ever carried before. It consists of two ten-inch pivot guns of extraordinary size, weighing over ten thousand pounds each; twenty-eight nine-inch guns of nine thousand pounds each; fourteen eight-inch, sixty-three hundred-weight; two twelve-pound howitzers for the launches, and two twelve-pound light howitzers, for the cutters. The battery altogether weighs over three hundred and ninety tuns. The armorer's department of the ship has over three hundred pieces of small arms, and the "shot-locker," three thousand eight hundred rounds of solid ball and shell, loaded and empty.

The steam frigate *Minnesota* sailed from Boston a few days since under sealed orders from the Navy Department. She carries a very heavy armament, and is considered one of the most efficient war vessels ever sent to sea. She is in complete fighting trim, and is in charge of officers who will give a good account of themselves.

The powerful steam frigate *Niagara* is rapidly preparing for active service.

The brig *Bainbridge* is all ready for sea, and will sail in a few days under the command of Lieutenant Thomas M. Brazer.

All matter connected with the navy are managed with great prudence, and the public curiosity is held in abeyance for prudential reasons. In due time the seemingly quiet operations of this power will be brought prominent to public notice. As an evidence of the spirit that animates the supporters of the government, it is worthy of note that at a meeting of the leading shipowners and commercial men of Maine, summoned by the Governor, resolutions were adopted tendering the services of the shipowners to the government, and pledging their ability to furnish thirty steam vessels within from sixty to ninety days, if required, and a committee was appointed to proceed to Washington at once to communicate with the government.

The United States school ship *Constitution*, formerly at Annapolis, has sailed from that post for Newport, R. I. It is the intention of the government to establish the naval school at the latter place.

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HISTORY AND INDEX OF ARTICLES ON IMPLEMENTS OF WAR, RIFLES, SHOOTING, AND EXPERIMENTS IN GUNNERY, PUBLISHED IN THE "SCIENTIFIC AMERICAN."

It frequently happens that many useful improvements are invented which do not come in use for years afterward; and, indeed, not until some great event, or some change in business, furnishes a field for their operation, and a demand for their introduction. This is the case, we believe, with many inventions relating to the art of war which have been illustrated and described in the columns of the SCIENTIFIC AMERICAN. Several of these have been forgotten in the peaceful and tranquil times in which we have hitherto lived, and during the urgent demand which now rings through the land for the most effective war implements, many persons may be cogitating upon subjects new to them but old to us: while others who would gladly avail themselves of all the information which they can obtain on the subject, may be ignorant of the best source where to seek it.

In order to meet a want felt at this time, we give the following historical sketch and index of war and shooting inventions as they have appeared in successive volumes of the SCIENTIFIC AMERICAN:—

A cannon operated by two men, to project bullets in a perfect stream, by compressed air; illustrated and described in Vol. I. (old series), on the 14th of May, 1846.

Fitzgerald's wrought iron cannon, formed by a series of concentric flat rings, bolted longitudinally together by long rods; illustrated on page 220, Vol. II., April 3, 1847.

Expanding bullets; page 20, Vol. III., October 9, 1847. When discharged from a cannon it branches out into huge knives, and cleaves everything before it. It is more terrible than the chariots of old Philistia.

Nichols' electric gun: page 172, Vol. III., February 19, 1848. A self-charger with gun-cotton, ignited by electricity. An ingenious and destructive war engine.

Gun-cotton engine; engraving on page 180, Vol. III., February 26, 1848.

Hubbell's patent breech-loading musket: page 108, Vol. IV., December 23, 1848. This fire-arm was used by several of our regiments during the Mexican war.

Prussian breech-loading rifle, called "Zünd Nadel," page 124, Vol. V., January 5, 1850. This was the breech-loading rifle used by the Prussian army during the Holstein war.

Sharpe's breech-loading rifle; page 193, Vol. V., March 9, 1850. This rifle has a vertical sliding breech, operated by a toggle-joint lever.

Sharpe's rifle, with Maynard's primer: page 196, Vol. VI., March 8, 1851.

Rifle shooting, illustrated with several designs of several bullets; page 173, Vol. VII., February 14, 1852. This article contains an interesting account of rifle practice in the French army.

Rifled cannon at Woolwich, England.: page 196, Vol. VII., March 6, 1852.

An article on rifle shooting, illustrated with two targets, by John Chapman, Esq., author of the "American Rifleman." At 110 yards distance the ten shots fired were placed within a circle of 11 inch in diameter: at 220 yards distance, the ten shots were placed within a circle of 23 inches diameter. A Wesson rifle, with globe sights, was used. Page 203, Vol. VII., March 13, 1852.

Marston's breech-loading rifle and pistol; illustrated on page 129, Vol. VIII., January 8, 1853. These fire-arms load at an opening in the side, with a cartridge. A ramrod on a toggle-jointed lever forces in the charge, which has a leather sabot upon its end.

Beverly's breech-loading, self-priming rifle; page 188, Vol. IX., February 25, 1854. The charge chamber swings up on a pivot joint, and the cartridge is placed in it, separate from the barrel. A string of percussion caps follows behind the charge chamber.

Measuring inaccessible distances by firing cannon, by Ab. Alcock; illustrated on page 224, Vol. IX., March 25, 1854.

Perry's breech-loading rifle; page 4, Vol. X., September 16, 1854. The chamber of this rifle swings on a joint.

The Lancaster gun, with elliptical, spiral grooves; represented on page 168, Vol. X., February 3, 1855. It was used in the Crimean war.

Extracting bullets from wounds, by an air pump; described on page 186, Vol. X., February 24, 1855. This invention deserves the attention of army surgeons at the present time.

Newton's breech-loading pistol; illustrated on page 220, Vol. X., March 24, 1855. Loads with cartridge fed in by a breech pin.

New rifle bullets; engraving on page 245, Vol. X., April 14, 1855. A lead band is shownon an iron conical bullet, for cannon. It is also mentioned that L. Houghton, of Philadelphia, obtained a patent on the 4th of April, 1855, for an expanding belt for rifled guns.

Perry's breech-loading rifle, improved; page 304, Vol. X., June 2, 1855. The breech of this rifle is perfectly gas-tight to prevent leakage.

Russian infernal machine, to blow up British frigates at Cronstadt; illustrated on page 368, Vol. X., July 28, 1855. These machines were to be discharged by the wires of a galvanic battery.

Whitney's repeating pistol; engraving on page 404, Vol. X., September 18, 1855. Several charge chambers may be kept loaded for this pistol, and 100 shots fired rapidly in succession.

Russian infernal torpedo; illustrated on page 8, Vol. XI., September 15, 1855.

New explosive shell; engraving on page 21, Vol. XI., September 29, 1855. This shell has an expanding lead band on its bottom, to adapt it for rifled cannon.

English breech-loading cannon, with spiral shot for smooth bores; engraving on page 400, Vol. XI., August 23, 1856.

Newberry's breech-loading rifle: illustrated on page 92, Vol. XII., November 29, 1856. This is a self-primer which cocks the hammer automatically.

Great centrifugal war engine of Reynolds: described on page 147, Vol. XII., January 17, 1857., by one of the gentlemen who made experiments with it.

Account of trials at West Point and Washington with breech-loading rifles; pages 6, 14, 49, 113, 390, 401, 406, Vol. XIII.

Captain Norton's gossamer cartridge; illustrated on page 382, Vol. XIII., August 7, 1858.

Newberry's revolver pistol; illustrated on page 80, Vol. XIV., November 13, 1858.

The above are all included in the old series of the SCIENTIFIC AMERICAN.

English breech-loading cannon, represented to be Armstrong's gun; illustrated on page 16, Vol. I. (new series), July 2, 1859.

Shull's breech-loading rifle; illustrated on page 160, Vol. I., September 3, 1859. It has a pricker for opening its cartridge.

Gun-cotton, how to make it; page 84, Vol. II., February 4, 1860.

Captain Brown's breech-loading cannon; illustrated on page 240, Vol. III., October 6, 1860. This cannon has lately been brought before the authorities of Rhode Island, by the inventor, who resides at Warren, R. I.

Clay's breech-loading steel cannon: engraving on page 48, Vol IV., January 19, 1861. This is a more simple breech-loading cannon than Armstrong's. Two 100-pounders of this character have lately been ordered of Mr. Clay by the British government.

Spiking cannon; illustrated on page 43, present volume, January 19, 1861.

La Gloire, the French iron-cased frigate; on page 97, present volume, February 16, 1861.

The broken and dismounted Armstrong gun; illustrated on page 232, present volume, April 13, 1861.

Path of conical bullets; illustrated on page 234, present volume, April 13, 1861.

Army rifle exercise, and forms of bullets used for different rifles; illustrated on page 292, present volume, May 11, 1861.

Hotchkiss' expanding cannon bullet; illustrated on page 293, present volume, May 11, 1861, with target showing the shooting with it.

Explosive rifle bullets; engraving on page 304, May 11, 1861.

Rodman's monster cannon; illustrated on pages 305 and 306, May 18, 1861.

We have in hand a number of other subjects pertaining to war, which will be illustrated in these columns from week to week.

Among the number of seemingly excellent inventions in ordnance, we shall illustrate, in our next issue, an engraving of G. B. Brayton's breech-loading cannon.

History of Our Flag.

The flag, during the confederation, was endorsed by the Congress of that body, by a resolution adopted on the 14th of June, 1777, in the following words:—

RESOLVED, That the flag of the thirteen United States be thirteen stripes, alternate red and white: that the union be thirteen stars, white in a blue field, representing a new constellation.

This flag continued in use under the Constitution until the 4th day of July, 1818, having passed with unsullied honor through the war with Great Britain, from June, 1812, to its close by the ratification of the treaty of Ghent, in February, 1815.

In the year 1818, the number of States in the Union amounted to twenty, and on the 4th of April, 1818, the Congress of the United States passed a law in the following words:—

Be it enacted, &c.—

SECTION 1, That from and after the fourth day of July next the flag of the United States be thirteen *horizontal* stripes, alternate red and white: that the union be twenty stars, white on a blue field.

SECTION 2, That on the admission of every new State into the Union, one star be added to the union of the flag, and that such addition shall take effect on the fourth day of July next succeeding such admission.

So stands the law at this day, and is unalterable but by law.

On the fourth of July, when the Congress of the United States next assembles, the State of Kansas will, according to law, appear as a new star in the Flag of our Union.

Armstrong Guns at the West Point Foundry.

We have been shown a complete set of working drawings of the Armstrong gun, which were procured in England by the Russian government, and sent to the West Point Foundry, at Cold Spring, in this State, where a sample gun was made and forwarded to Russia. The gun was tried here before it was sent away, and operated so satisfactorily that the owners of the West Point Foundry are commencing the manufacture of these famous weapons for the supply of our army. It is suggested that the destruction of outlying rifle men, mentioned by the *Mechanics' Magazine* as having occurred in China, was the fault of the shot and not of the gun; while the ease with which the cannon was broken in pieces by shot from an ordinary nine-pounder showed merely that the piece was made too light. For obvious reasons, we are not at liberty to explain the process of making the gun, but will remark that it is entirely different from that published in the English papers.

PATENT OFFICE APPOINTMENTS.—We are happy to learn that Dr. Thomas Antisell has been promoted to the position of Chief Examiner in the Chemical Department. Dr. Antisell has performed the duties of this position for a long time, and it is creditable to Commissioner Holloway that he has recognized the services of an accomplished officer, one of the most respected and faithful men in the Office. John J. Coombs, of the District of Columbia, has been appointed Chief Examiner in the Patent Office.

SHOULDER ARMS!—The scene in front of our office is animated in the extreme, and furnishes a daily index of the military spirit of our people. In all the open space about the barracks, squads of volunteers are constantly drilling in the presence of a large crowd of spectators, and it is gratifying to see the spirit with which the soldiers enter upon their preparations to take the field. So far as we know the men they are true, and will not be found wanting when the hour of trial shall call them to duty.

THE first use of artillery was, according to some historians, by the Moors at Algesiras in Spain. The Venitians are said to have been the first to use cannon at sea, in 1377, against the Genoese.

WITH military authorities, the meaning of the right bank of a river is the bank at the right hand in looking *down* the stream.

"A stand of arms," properly speaking, is a complete set of arms for one soldier, which would include the bayonet, musket, and its appurtenances.

THE Bank of Paris has exchanged thirty millions of gold with Russia for an equal amount of silver.

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Colt's Armory—The Colonel on the Side of the Government.

Some suspicion having been cast upon the loyalty of Colonel Colt, growing out of the fact that he has heretofore made many arms for the South, it is due to him to state that, although decidedly opposed to the election of Mr. Lincoln, yet as soon as he heard of the insult to the flag at Fort Sumter, and saw the proclamation of the President calling for troops to put down treason, he at once tendered the use of his armory to the government at Washington, offering to the President the complete control of its entire production, to be used in arming troops to defend the constitution and preserve the Union.

And, beside this (as stated in our last number), he presented to the State of Connecticut over $50,000 worth of his recently improved breech-loading rifles, sufficient to arm a regiment of 1,000 men, and tendered his personal services, together with one full company of mechanics from his armory, skilled in the use of this weapon, to drill and instruct the soldiers in their use. This patriotic offer has been accepted by Governor Buckingham.

The rifle is a terrible weapon; each one carries five charges in the cylinder, and at the commencement of an engagement this regiment of 1,000 men can, in a few seconds, pour in a most destructive fire of 5,000 Minié balls, and afterward load and fire faster, and with more accuracy, than can be done with any muzzle-loading rifle ever used in war. This corps is to be called the First Connecticut Regiment of Colt's Revolving Rifles.

As our readers are aware, Colt's armory is situated at Hartford, Conn., and is no doubt the most complete and extensive establishment of the kind in the country.

The perfection of his machinery for making the various parts of his different arms is almost beyond the power of the imagination to conceive. So perfect is it in the performance of the uses to which it is applied, that it seems to be endowed with the power of reason. He is now running his machinery day and night, and creating daily hundreds of the most terrific engines of destruction ever invented.

His improved revolver, which received such high commendation from a board of army officers in May last, is certainly one of the most terrible and efficient weapons for defensive or offensive war ever used by man.

Unused to Arms.—The Savannah *News* says "not one in a thousand of the filthy multitude who are shrieking for war in New York has ever seen a gun, except in a shop window." We advise the editor not to believe that story, and we presume he does not, for it is not true. New York city not only boasts of some of the finest drilled military companies to be found in the world, but her numerous companies of target shooters, now "shrieking for war," are thorough adepts in the art of plugging the bull's eye, and can stand as much of rough and tumble as any other set of men. The bravery of the Southern men is not denied, and they will make a great mistake if they suppose that Northern men can't stand fire. History and experience teach a different lesson.

General Butler and a Baltimore Committee.—A committee of Union men from Baltimore visited the Maryland Legislature lately, to protest against the public safety bill there pending. On their return they stopped at the Relay House and called on General Butler, and had a pleasant interview. The General said that like them he was opposed to Mr. Lincoln and the Republican party in politics, but that had nothing to do with the present crisis. The Union must be maintained, and the government upheld until any soldier in the country could walk anywhere in any state with perfect safety under the protection of the American flag. This would first be done, and afterward politics could be discussed.

Mr. James Gordon Bennett, Jr., has offered the government the use of his yacht *Rebecca*. He agrees to fit her up with Dahlgren guns and command her, provided the government will pay the expenses of seven additional seamen.

The amount of paper manufactured in Great Britain the past year was 223,575,285 pounds. The net produce of the duty was about $6,500,000.

THE PATRIOTIC CONTRIBUTIONS.

Free Gift Contributions of the People—Over $23,000,000 Advanced for War Purposes.

Albany, N. Y.	$46,000	Milwaukee, Wis.	$31,000
Auburn, N. Y.	4,000	Marblehead, Mass.	5,000
Abington, Mass.	5,000	Malden, Mass.	2,000
Amesbury, Mass.	5,000	Madison, Ind.	6,000
Acton, Mass.	5,000	Mount Holly, N. J.	3,000
Boston, Mass.	186,000	Morristown, N. J.	3,000
Brooklyn, N. Y.	75,000	Mystic, Conn.	7,000
Bridgeport, Conn.	31,000	Madison, Wis.	9,000
Burlington, Vt.	3,000	Marlboro', Mass.	10,000
Bath, Maine	10,000	Marshfield, Mass.	5,000
Batavia, N. Y.	4,000	New York (State)	3,000,000
Buffalo, N. Y.	110,000	New York (city)	2,173,000
Burlington, N. J.	4,000	New Jersey (State)	1,000,000
Bordentown, N. J.	3,000	Mewark, N. J.	136,000
Bradford, Vt.	2,000	New Haven, Conn.	30,000
Bridgeton, N. J.	1,000	Norwich, Conn.	13,000
Bedford, Mass.	2,000	New London, Conn.	10,000
Bennington, Vt.	10,000	New Brunswick, N. J.	2,000
Barre, Mass.	2,000	Needham, Mass.	3,000
Braintree, Mass.	2,000	Newton, Mass.	3,000
Bedford, N.Y.	1,000	North Andover, Mass.	3,000
Brunswick, Maine	1,000	Noblesville, Ind.	10,000
Binghamton, N. Y.	10,000	Newbury, Mass.	3,000
Connecticut (State)	2,000,000	Newburyport, Mass.	4,000
Cincinnati, Ohio	280,000	Ohio (State)	3,000,000
Charlestown, Mass.	10,000	Oswego, N. Y.	13,000
Chicago, Ill.	20,000	Ottawa, Ill.	18,000
Circleville, Ohio.	2,000	Pennsylvania (State)	3,500,000
Clinton, Ill.	5,000	Philadelphia, Pa.	330,000
Cohassett, Mass.	1,000	Plymouth, Mass.	2,000
Clinton, N. Y.	1,000	Poughkeepsie, N. Y.	10,000
Concord, Mass.	4,000	Piqua, Ohio	20,000
Concord, N. H.	10,000	Paterson, N. J.	10,000
Canandaigua, N. Y.	7,000	Portland, Maine	31,000
Canton, Mass	5,000	Princeton, N. J.	2,000
Cass county, Ind.	6,000	Palmyra, N. Y.	6,000
Cam. & Am. RR. Co.	10,000	Quincy, Mass.	10,000
Detroit, Mich.	50,000	Rhode Island (State)	500,000
Dunkirk, N. Y.	20,000	Rochester, N. Y.	69,000
Dover, N. H.	10,000	Rockland, Maine	10,000
Damariscotta, Maine	3,000	Salem, Mass.	15,000
Elizabeth, N. J.	11,000	Stowe, Mass.	2,000
Elkhart, Ind.	8,000	Schenectady, N. Y.	2,000
Erie, Pa.	25,000	Seneca Falls, N. Y.	3,000
Evansville, Ind.	15,000	Stockbridge, Mass.	3,000
Fall River, Mass.	10,000	Sycamore, Ill.	4,000
Flemington, N. J.	5,000	St. Albans, Vt.	10,000
Fond du Lac, Wis.	4,000	Sag Harbor, N. Y.	3,000
Gloucester, Mass.	10,000	Saratoga Springs, N. Y.	2,000
Glen's Falls, N. Y.	10,000	Southboro', Mass.	2,000
Great Falls, N. H.	10,000	Syracuse, N. Y.	34,000
Greensburg, Ind.	2,000	Salsbury, Mass.	5,000
Georgetown, Mass.	5,000	Shelburne, Vt.	1,000
Galena, Ill.	1,000	Schuylkill county, Pa.	30,000
Hudson, N. Y.	4,000	Sutton, Mass.	6,000
Hamilton, Ohio	1,000	Troy, N. Y.	48,000
Hoboken, N. J.	2,000	Toledo, Ohio.	5,000
Hornellsville, N. Y.	1,000	Taunton, Mass.	40,000
Hartford, Conn.	64,000	Utica, N. Y.	14,000
Harrisburg, Pa.	5,000	Upper Sandusky, Ohio	5,000
Illinois (State)	2,000,000	Vermont (State)	1,000,000
Indiana (State)	1,000,000	Wisconsin (State)	225,000
Iowa (State)	100,000	Weymouth, Mass.	5,000
Ithaca, N. Y.	10,000	Wilmington, Ohio.	3,000
Indianapolis, Ind.	5,000	Waynesville, Ohio.	2,000
Ipswich, Mass.	4,000	Waltham, Mass.	5,000
Jersey City, N. J.	32,000	West Cambridge, Mass.	10,000
Janesville, Wis.	6,000	Woodstock, Vt.	1,000
Kenton, Ohio.	2,000	Watertown, Mass.	2,000
Keene, N. H.	10,000	Waterford, N. Y.	8,000
Lynn, Mass.	10,000	Watertown, N. Y.	3,000
Lockport, N. Y.	2,000	Warsaw, N. Y.	3,000
Lawrence, Mass.	5,000	Westboro', Mass.	8,000
Lowell, Mass.	8,000	West Troy, N. Y.	7,000
London, Ohio.	1,000	Woburn, Mass.	5,000
Lancaster, Pa.	5,000	Woodbury, Conn.	5,000
Lebanon county, Pa.	10,000	Webster, Mass.	4,000
Maine (State)	1,300,000	Xenia, Ohio.	14,000
Michigan, various places	50,000	Zanesville, Ohio.	3,000
Total			$23,271,000

The Pen and the Sword.—In the great campaign now opening the press will have its share of the work to perform. Some of our brethren will remain at home to chronicle the stirring events of the day while others will drop the pen and grasp the sword. Among the many incidents of the kind we record none more pleasing than the case of Joseph M. Barr, editor of the *Commonwealth*, Wilmington, Del. He announces his purpose in the following gallant style:—

The editor of this paper is going to the war, having raised a company, and been appointed an officer of the First Regiment of Delaware Volunteers, will march with the regiment, and continue with it during the campaign. He will keep up a regular correspondence with his paper; and those who wish to know all about the sayings, doings, incidents, accidents, exploits, history, &c., of the "Blue Hen's Chickens" who go to War, had better subscribe at once for *The Commonwealth*.

Taking out all the Grease from the Axis!—A gentleman who has spent some days in the region of the oil-wells in Pennsylvania, says that, in his opinion, the government of the United States, or some other mundane power, ought to interfere at once and put a stop to further boring and pumping for oil on this continent. He is quite certain that the oil is being drawn through these wells by the bearings of the earth's axis, and that the earth will cease to turn when the lubrication ceases. Such a suspension would beat anything that ever agitated Wall-street, and the consequence will be too great for ordinary minds to contemplate or comprehend. It had better be attended to at once.

The great leading builders in London have resolved hereafter to pay their workmen by the hour instead of the day; 15 cents an hour for experienced hands and 9 cents for laborers.

The Spanish government is building ten additional ste am sloops of war for the suppression of the slave trade on the coast of Cuba.

Treatment of Grape Vines.

The Irish *Agricultural Review* contains the following very sensible information on this subject:—

The vine flourishes on the mountain sides, in rocky soils; so nature points clearly to a dry situation as best adapted for its roots. The border should (if circumstances permit) stand considerably above the surrounding ground, with a good inclination to the south. The ground should be excavated to the depth of three feet from where the intended surface of the border is to be, and the bottom sloped with a gentle inclination to the outside of the border, with a drain sunk along the front, say six inches below the fall of the border. This drainage should have an inclination to either end of the border, or should fall from both to the center of the border, and open into a good drain, to take the water from it; the object being to keep the border perfectly free from stagnant water. If circumstances will permit of it, the border should be at least fifteen feet wide. The following compost will be found well suited for the vine. Three-fourths of good sound turfy loam of medium texture, from a dry pasture, and full of vegetable fiber; add one-fourth good rotten manure, and bones, charcoal, or any charred vegetable matter, and lime rubbish sufficient to keep it thoroughly open. Such a soil will keep the vine in a sound, healthy condition for a number of years. Many grape growers use a much richer compost, and add a large quantity of animal matter; the result may be splendid grapes for two or three years, but the vines will ultimately become plethoric, and almost useless. Bones should be introduced largely, as the vine seems partial to them, and as their decomposition is gradual, they naturally supply the plant with nutriment, in such quantities as it can assimilate for a great number of years.

The mildew on the vine, like its fellow, the potato disease, has become epidemic this last few years, attacking the vine under all circumstances, and in all parts of the world, wherever grown. It is a parasitic fungus; but where it comes from seems a puzzle. It generally makes its appearance wholesale, and without warning. Flowers of sulphur seems to be the best, and most simple remedy for it. As soon as detected on the leaves or fruit, lose no time in dusting the parts affected thoroughly with the sulphur, the first application will generally destroy it; but a sharp look-out must be kept, as fresh attacks may be expected when it has once made its appearance; a deadly war must, therefore, be waged with it.

[The Black Hamburg and other popular varieties of the European grape are entirely different from native American grapes, such as the Isabella, Catawba, &c.; the pulp of European grapes being soft and melting in the mouth. On this continent, east of the Rocky mountains, none of the European varieties of grape can be cultivated successfully in the open air, though they are produced in the very highest perfection in glass-houses, either with or without artificial heat. The season is long enough to ripen them in the open air, but they are very subject to mildew, and even under glass a free use of sulphur is generally necessary to prevent this blight. Within a few years the same disease has made its appearance in the vineyards of Europe, and is spreading extensively. Spanish priests carried the best kinds of grape vines known in Europe to California nearly 300 years ago, and they have flourished there ever since. Sometimes 20 tuns are carried at one time on a steamer from Los Angeles to San Francisco, where they sell at 12 cents per lb., while the same varieties are retailed in New York at one dollar and a half per lb.—Eds.

The First Vermont Regiment.—Directly in front of our windows in the Park, we see the grey uniforms of the first Vermont regiment. They are a hardy, intelligent, robust body of men, 850 in number, inured to labor, and quite as familiar with the rifle as the famous hunters of Kentucky. They make no boasts, but modestly invite the attention of the country to their conduct in the hour of battle.

Great Waterfall.—During the late expedition of Dr. Livingstone up the Zambesi, in Africa, he measured the hight and breadth of Victoria falls on that river. Their hight is 300 feet; breadth, 2,000.

The savings banks in England have deposits amounting, in the aggregate, to two hundred millions of dollars.

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Fire Clay and Iron Gas Retorts.

On page 291 of the present volume of the SCIENTIFIC AMERICAN we described the operations and mode of making fire brick, condensed from Mr. Stephenson's lecture on the subject, published in the London *Engineer*. We now give in substance the concluding part of his paper relating to the manufacture of fire clay retorts.

MOLDING.

The clay for making retorts is not ground so fine as for bricks. It is passed through a riddle or screen having about four meshes to the inch, and to render the retorts porous, about 20 per cent of sawdust or fine coke is mixed with the clay and put in the pug mill with it. The retorts are molded by hand by pressing small lumps of the clay against the side of the mold, which is set vertically, until the length, form and thickness are secured. Each retort is built slowly, about nine inches of clay being put on the mold at intervals of several hours to insure soundness, as the clay is liable to crack in drying. The process of building a retort is continued every day, or as often as necessary, till any length of retort is obtained, the top end always being kept perfectly moist, to guarantee perfect adhesion throughout the whole. The sheds in which these retorts are made are constructed like brick sheds, excepting that more hight is allowed from the level of the floor to the joists. Fires are constantly kept burning under the floor on which the retorts are being built, and this process of drying is perhaps one of the most important of the manufacture. If not carefully and properly dried, cracks will show all over the surface.

In order to make the mass of clay porous, and yet prevent this porosity causing a leakage when distilling coal in making gas, a mixture, composed of about equal parts of unburnt and calcined fire clay finely pulverized, with the addition of as much water as renders it of a consistency of thick paste, is applied day by day to the internal and external surfaces of the retorts, and well worked in by the hand; thus an even, smooth and unbroken surface, free from cracks and flaws, is produced, and the retort presents a uniform appearance throughout.

BURNING.

The burning of the retorts requires much care and attention, and generally continues for a period of ten or twelve days. The retorts being placed vertically on rows of bricks on the bottom of the kiln, the great desideratum is to procure a steady draft, the exclusion of atmospheric air, and a gradually progressive heat. Opinions differ very widely as to the best shape of clay retorts, the circular, oval or elliptical, and ⌀, being those commonly advocated and in use. In the leading works the 15-inch round, and 21-inch × 15-inch oval, in settings of five and seven retorts in a bench, appear to be in favor; these retorts being from 18 feet 6 inches to 20 feet in length, open throughout, and charged at each end. They are constructed in three or four pieces to suit convenience.

HISTORY OF CLAY RETORTS.

The introduction of clay retorts seems to be due to Mr. Grafton, who, as early as the year 1820, took out a patent in England for their use. His retorts were at first square, but soon after were altered, and were constructed in sections of about 16 inches in length. These retorts were 5 feet wide and 18 inches high, being 7 feet long, resembling an oven in their general contour. This shape was used for many years in some of the provincial works of Great Britain, and are perhaps still employed to some extent, although they have been generally replaced by the oval, circular and common ⌀ shaped retort.

The gasworks of Scotland were among the first to apply clay retorts, and their use is now almost universal in that country. They were there employed for a considerable period before their general introduction into England.

MERITS OF CLAY AND OF IRON RETORTS.

The comparative merits of clay and of iron retorts is a subject which has attracted much attention from the gas engineering profession during the past few years.

The superior qualities claimed for clay retorts over those made of iron are as follows:—Their cost is less than iron; they are more durable; they have more carbonizing power; they produce a greater quantity and a better quality of gas. There are some parties who still advocate the use of iron retorts, and who, of course, will not admit these claims. At the South Metropolitan Works, in London, seventeen months have been considered a fair duration for clay retorts, each one having produced 1,800,000 feet of gas; the expenditure of coal being no greater than that of iron retorts. Mr. Barlow, the editor of the *Journal of Gas Lighting*, estimates 700,000 cubic feet of gas as the average yield of iron retorts. In the report of the chairman of the City of London Gas Company, January, 1859, the strongest testimony is adduced in favor of clay over iron retorts.

Out of 468 clay retorts in constant use by the above company, 196 had been in operation for four years.

The advocates of iron retorts have contended that a much greater amount of fuel is required for carbonizing with clay retorts. It is true that the heat deemed most suitable for generating gas from them is several hundred degrees higher than that used with iron, but with this intensity they are efficient in producing a larger amount of gas than would be generated at the lower degree of heat required by iron retorts.

There is quite a difference of opinion among gas engineers respecting the merits of iron and clay retorts, and as this is a question of great importance to communities where gas is burned, we will give both sides of the question.

In the last annual report of the engineer of the Philadelphia Gas Works, he says:—

Prominent among the many questions that engage the attention of the gas engineer, are those of the material and form of retorts. Iron, both cast and wrought, and fire clay, either made into bricks or molded, are the materials in common use. Experiments on these materials were begun at our works in 1838, and have been repeated from time to time, whenever some alleged improvement made such trials expedient. Recently the growing interest in the subject has led to a more extensive series of trials than any before attempted. The number of retorts used in these experiments is nearly one hundred, supplied by different makers, both American and foreign. Thus far they have not yielded results as economical as we usually obtain from plain cast iron, but the trials are not considered to be entirely conclusive, and they will therefore be continued with other retorts of different forms of American manufacture, some of which appear to be of better quality than those before used.

In London it is held that fire clay retorts have enabled the gas companies to reduce the price of gas; in Philadelphia, such retorts have not yielded such good results as those made of iron. How is this to be explained?

THE PATENT OFFICE—PATENT CLAIMS.

Business is being conducted at the Patent Office as usual, and a good list of cases was passed for issue last week and the week previous, but owing to the some derangement in the Recording rooms, the copyists have not been able to get the documents engrossed and mailed as punctually as usual. For the same reason we had not received our official list of claims at the time of going to press, but we are assured that all these delays will be remedied hereafter. Our next issue will probably contain the claims of all the patents issued since April 23d.

Notes and Queries

E. W., of Pa.—A series of experiments made a few years since by one of the officers of our army, at Washington, demonstrated conclusively that a gun is less liable to burst if the wad is not driven down upon the powder, and the harder it is driven, the greater is the danger of bursting.

W. L., of Pa.—Mr. Downing recommended for live fences, the osage orange for the Southern States, and the buckthorn for the Northern. We have tried the buckthorn. If it is cultivated in very rich ground, kept clear of weeds, and very thoroughly pruned down, while young, it will make a good hedge in four or five years. Put a little glue in common whitewash, to make it adhere.

R. J. E., of England.—Copies of the drawings desired by you would cost $4; each of the specifications, $7.

C. B. B., of Pa.—We will furnish you one stereotype of the map for $3.

R. J., of Ohio.—On page 129, Vol. VI. (old series) of our journal, you will find an illustrated description of machinery for making and baking bread, raised by water impregnated with carbonic acid gas. There is no patent in force, so far as we know, claiming the use of carbonic acid gas for raising bread. No such patent, if granted, would be valid.

W. N. C., of Cal.—I. Arnaboldi, No. 69 Fulton-street, this city, will furnish you with the curved glass tube which you desire to obtain.

H. M., of Col. Ter.—You can make a most excellent writing ink by boiling 4 lbs. of logwood and 2 lbs. of sumac in 5 gallons of water for two hours; then adding 5 ounces of copperas and 2 ounces of gum-arabic. Of course you must strain the liquid, and use only the free, flowing fluid.

C. F., of N. Y.—You can obtain all the books necessary for you to learn the art of military engineering at Van Nostrand's, No. 192 Broadway, this city.

R. A. K., of La.—We regret that we are unable to supply the information you seek in reference to the frigate *Pennsylvania*, recently burned at Norfolk. She was the largest ship of the line ever built by our government; she mounted 120 guns; tunnage, 3,241.

J. F. P., of N. Y.—The peat which you send us is a very good article, and will make both gas and oil. Peat, however, never has been found to compete with coal in making oil. It is cheaper than coal for gas in situations where coal costs more than about $10 per ton. The formation under the peat is marl, a very valuable manure. The peat, too, makes good manure.

W. S. G., of N. Y.—Giffard's Injector has been patented in this country.

A VOLUNTEER, Ill.—Your wrought iron cup attached to a ball is an old thing, and not patentable. The patent records show several examples of it.

T. S., of Pa.—A wheel 40 feet in diameter is double the power of one 20 feet in diameter, using the same quantity of water, if the fall is in proportion to the diameter of each wheel—20 feet in one case, and 40 in the other. There is no power in the wheel itself; the power is in proportion to the quantity of water and perpendicular hight of the fall.

H. B., of Mass.—The composition employed by blacksmiths for welding cast steel consists of five ounces of borax and half an ounce of salammonia pounded together, then fused in an iron vessel, and poured out in a cake and cooled. It is now ground to powder, and in this condition used for welding. The steel is now raised to a yellow heat in a clear fire, then rubbed with some of the powder, which should be kept upon a stone on the hearth; then the steel is again treated as before, and is fit to be placed under the hammer. Iron and steel may be welded together with this powder by carefully managing the heat of each.

S. H. C., of N. J.—The stone which you have sent us is composed of black and white mica and some silica. It came originally from the rocks in the highlands of New York.

F. H. C., of N. Y.—If you can obtain a classical education before commencing to learn the trade of a machinist, we advise you to go to college as soon as possible.

A. B. G., of Conn.—There are several instruments for army use by which distances of objects can be ascertained. They are generally complicated and expensive. Yours may be patentable; if we saw a model, we could give you more definite information.

Money Received

At the Scientific American Office on account of Patent Office business, for the week ending Saturday, May 11, 1861:—

F. R., of Ind., $15; A. B. C., of N. Y., $25; E. S., of Mass., $25; J. C. B., of N. Y., $15; N. H. B., of Mass., $15; J. B., of Ind., $25; A. S. W., of N. Y., $15; T. S. & T. W. R., of N. Y., $15; S. J. M., of Ohio, $25; F. & M., of N. Y., $15; J. K., of Scotland, $15; J. B., of Ohio, $15; S. M. & Co., of Vt., $225; U. B. V., of Pa., $15; R. K., of Mass., $40; W. W. H., of N. Y., $30; J. G., of N. Y., $25; A. H. J., of Cal., $30; J. A., of Conn., $15; C. Van N., of N. Y., $25; J. & G. B., of Wis., $25; J. A. T., of N. Y., $35; R. W., of Pa., $10; T. G. E., of Mo., $30: M. J. K., of N. Y., $25; M. & K., of N. J., $15; F. L. H., of Vt, $25; A. M. O., of Wis., $15; P. & B., of Mich., $15; S. J. P., of Conn., $15; F. N., of Conn., $10; S. D. C., of Conn., $15; A. S., Jr., of N. Y., $40; E. D. C., of Vt., $20; S. R. W., of N. Y., $25; J. A. B., of Mich., $10; C. & C., of N. Y., $30; H. C., of Cal., $30; A. C. C., of R. I., $10; L. H. D., of Iowa, $25; M. N., of Mass., $25; J. N. H., of N. Y., $25; J. H. & H. J., of N. Y., $25; W. B. S., of N. Y., $25; I. F., of Ky., $15; W. H. M., of R. I., $15; T. & R., of N. J., $200; T. P., of N. Y., $12; T. A., of N. Y., $10; J. B. D., of N. Y., $20; G. S., of Iowa, $25; C. H. M., of Pa., $40; A. B., of N. J., $20; G. B., of N. Y., $20; N. R. M., of N. Y., $20; G. & C., of N. Y., $25; A. D., of N. J., $25; W. C. C. of Wis., $20; T. S., of N. J., $40; R. B., of Iowa, $25; C. H., of La. $25; J. R. A., of Ill., $25; S. & A., of Iowa, $25; G. R. D., of N. Y., $25; E. & H., of N. J., $25; A. M., of Maine, $25; J. J. H., of Ky., $25; C. F. V., of Ill., $15; G. S. R., of Ill., $25; J. J. H., of Ky., $20; S. S. H., of Mass., $15.

Specifications and drawings belonging to parties with the following initials have been forwarded to the Patent Office during the week ending May 11, 1861:—

C. H. M., of Pa.; T. S., of N. J.; J. H. J., of Cal.; J. B., of N. Y., J. N. H., of N. Y.; A. B. C., of N. Y.; E. S., of Mass.; M. N., of Mass.; S. J. M., of Ohio; C. & C., of N. Y.; G. S., of Iowa; R. K., of Mass.; S. R. W., of N. Y.; J. A. B., of Mich.; G. & C., of N. Y.; M. J. K., of N. Y.; L. H. D., of Iowa; J. G. B., of Wis.; J. G., of N. Y.; T. P., of N. Y.; A. D., of N. J.; E. D. C., of Vt.; W. W. H., of N. Y.; T. H. & H. J., of N. Y.; W. B. S., of N. Y.; C. H. B., of Pa.; C. Van N., of N. Y.; F. L. H., of Vt.; J. A. T., of N. Y.; N. B., of N. Y.; G. S. R., of Ill.

TO OUR READERS.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on Design Patents, when two good drawings are all that is required to accompany the petition, specification and oath, except the government fee.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

BINDING.—We are prepared to bind volumes, in handsome covers, with illuminated sides, and to furnish covers for other binders. Price for binding, 50 cents. Price for covers, by mail, 50 cents; by express or delivered at the office, 40 cents.

NEW PAMPHLETS IN GERMAN.—We have just issued a revised edition of our pamphlet of *Instructions to Inventors*, containing a digest of the fees required under the new Patent Law, &c., printed in the German language, which persons can have gratis upon application to this office. Address MUNN & CO.,
No. 37 Park-row, New York.

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CHANGE IN THE PATENT LAWS.

NEW ARRANGEMENTS—PATENTS GRANTED FOR SEVENTEEN YEARS.

The new Patent Laws, recently enacted by Congress, are now in full force, and promise to be of great benefit to all parties who are concerned in new inventions.

The duration of patents granted under the new act is prolonged to SEVENTEEN years, and the government fee required on filing an application for a patent is reduced from **$30** down to **$15**. Other changes the fees are also made as follows :—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Re-issue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing Disclaimer	$10
On filing application for Design, three and a half years	$10
On filing application for Design, seven years	$15
On filing application for Design, fourteen years	$30

The law abolishes discrimination in fees required of foreigners, except in reference to such countries as discriminate against citizens of the United States—thus allowing English, French, Belgian, Austrian, Russian, Spanish, and all other foreigners except the Canadians, to enjoy all the privileges of our patent system (except in cases of designs) on the above terms.

During the last sixteen years, the business of procuring Patents for new Inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN ; and as an evidence of the confidence reposed in our Agency by the Inventors throughout the country, we would state that we have acted as agents for more than FIFTEEN THOUSAND Inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of Inventors and Patentees, at home and abroad. Thousands of Inventors for whom we have taken out Patents have addressed to us most flattering testimonials for the services we have rendered them, and the wealth which has inured to the Inventors whose Patents were secured through this Office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive Offices, and we are prepared to attend to Patent business of all kinds in the quickest time, and on the most liberal terms.

Testimonials.

The annexed letters, from the last three Commissioner of Patents, we commend to the perusal of all persons interested in obtaining Patents:—

Messrs. MUNN & Co.:—I take pleasure in stating that, while I held the office of Commissioner of Patents, MORE THAN ONE-FOURTH OF ALL THE BUSINESS OF THE OFFICE CAME THROUGH YOUR HANDS. I have no doubt that the public confidence thus indicated has been fully deserved as I have always observed, in all your intercourse with the Office, a marked degree of promptness, skill and fidelity to the interests of your employers. Yours, very truly,

CHAS. MASON.

Immediately after the appointment of Mr. Holt to the office of Postmaster-General of the United States, he addressed to us the subjoined very gratifying testimonial:—

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Your obedient servant, J. HOLT.

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The Examination of Inventions.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submitit to us, with a full description, for advice. The points of novelty are carefully examined, and a reply written corresponding with the facts, free of charge. Address MUNN & CO., No. 37 Park-row, New York.

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The advice we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a Patent, &c., made up and mailed to the Inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh-streets, Washington, by experienced and competent persons. Over 1,500 of these examinations were made last year through this Office, and as a measure of prudence and economy, we usually advise Inventors to have a preliminary examination made. Address MUNN & CO., No. 37 Park-row, New York.

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The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

It would require many columns to detail all the ways in which the inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

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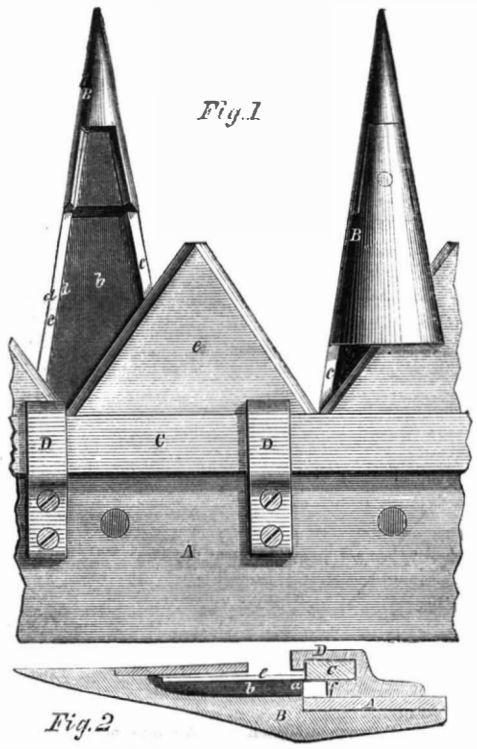
THAYER'S IMPROVEMENT IN HARVESTERS.

The object of this invention is to prevent the teeth of reaping machines from being clogged or obstructed in their operation; and the object is accomplished in a very effectual manner, as will be seen by the arrangements represented in the cut.

A represents the finger bar of a harvester, or a portion of one, with two fingers, B B, attached. These fingers are of the common open top form, and may be constructed as usual, with the exception that their back parts or shoulders, *a*, are recessed or hollowed out as shown at *b*, and these recesses at their back parts extend down to a level with the upper surface of the finger bar, A, as shown clearly in Fig. 1. The recesses, *b*, it will be seen by referring to Fig. 2, form a narrow wall, *c*, and two cutting edges, *d d*, at each



side of each finger. C represents a cutter bar to which the usual V-shaped teeth, *e*, are attached. The cutter bar, C, is fitted in guides, D, attached to the finger-bar, A, and these guides are sufficiently elevated to allow the teeth, *e*, to work on the back parts of the fingers. This arrangement admits of a space between the sickle and finger-bar, as shown clearly in Fig. 1. The guides, D, have projections, *f*, on their lower parts that form supports on which the cutters rest, and these projections also serve to assist the clearing of the cutters of any adhering matter.

From this description it will be seen that as the sickle is operated back and forth on the fingers, B, all substances that may be drawn underneath the teeth, *e*, will pass down through the recess, *b*, and out underneath the cutter bar, C. A free escape being thus allowed for these substances, the sickle is effectually prevented from choking or clogging. And as the juices contained in the grass have no opportunity to collect beneath the sickle on the bearing surfaces, *e*, of the fingers, any accumulations of resinous or gummy matters upon the sickle are prevented.

These fingers have been in use through two harvests, and it is stated that they will not clog in either wet or dry grain, even if the grain is badly tangled. They are also adjusted with great facility.

The patent for this invention was granted, through the Scientific American Patent Agency, March 26, 1861, to the inventor, D. H. Thayer, jointly with S. A. Baker, to whom an interest in the invention had been assigned. Further information may be obtained by addressing the patentees, at Ludlowville, Tompkins county, N. Y.

Improvements in Porcelain Manufacture.

Under the above head, the New York *World*, of the 3d inst., contains the following:—

A most ingenious invention has likewise been introduced in this art, namely, the production of objects by the mere pressure of the powdered material in a powerful press. It is found that sudden and severe pressure upon the damp powder causes it to cohere, and form a solid and compact mass of beautiful texture and polish. Thus, a polished button is produced at one blow of the press, out of a little heap of powdered clay. In the same manner, a tile of any shape, or a slab, is, at a stroke, formed out of the loose material. If necessary, they can be ornamented, and, after being dried, glazed and fired, are fit for use.

Where this invention is practised, we are not informed; but we suppose the information has been taken from some European publication. The improvement is very useful, but it has been practised in the porcelain works at Green Point, near this city, for seven years to our knowledge. All our porcelain shields and guards for the keyholes of doors, and many other articles, are struck out in this manner by die presses. We have been informed that this is an American invention.

CALKIN'S TRANSPARENT EYE SHADE, OR OCCHIOMBRA.

We take the following description of this useful article from the London *Druggist and Chemist*:—

This eye shade consists of a very light wire framework, over which is extended an extremely fine transparent fabric of gauze or other material. A portion of the framework (almost invisible to the by-stander) rests upon the nose, passes close to the face under the eyes to the temples, supporting the fabric at the lower part of the shade, thus forming a large chamber for the eyes. The material of which it is formed is sufficiently fine to protect the eyes from wind, sun, or dust, yet at the same time it permits the passage of the air so as to avoid the retention of the heat of the face; this advantage is still further insured by a lengthened opening in the upper part at B B, Fig. 2.

Its appearance, as shown in the engraving, is that of the usual shade; but more symmetrical and elegant in its outline.

The shade can be placed and removed with the same ease as a pair of spectacles; and is so light as to be scarcely perceptible to the wearer, being in weight about half an ounce.

If necessary, the fabric may be doubled, to meet the requirements of those with weak or inflamed eyes.

It is suggested that it will be found of great service to those who travel by railroad as a protection from sun and sand in tropical regions, and from sleet, wind and the painful glare from the snow in colder situations. It also relieves the angler from wind and glare reflected from the surface of the water; and will be found of especial service to ladies, and those who visit the sea-side, protecting them from excessive

wind and light, rendering it unnecessary for them to wear veils, and thus allowing free respiration of the pure sea air.

It does not in any way interfere with the wearing of spectacles; and is manufactured in different colors to meet the tastes of those who adopt it, and to suit those persons whose eyes require a neutral, blue, green, or any other tint.

The construction of the shade is fully shown in Fig. 2, where A A represents a spring fitting closely round the forehead, just above the eyebrows and a portion of the head.

B B, another portion of the framework, slightly in advance of A A, leaving an open space between the two for the free escape of generated heat, also supporting the fabric of gauze or other material.

C C, another portion of flexible material, which rests on the nose under the eyes, and takes the shape of the face extending to the temples, and supporting the fabric from D D, and forming the closed chamber.

D D, the portion of the framework which constitutes the external outline of the shade, assisting to support the fabric.

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